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The Automobile

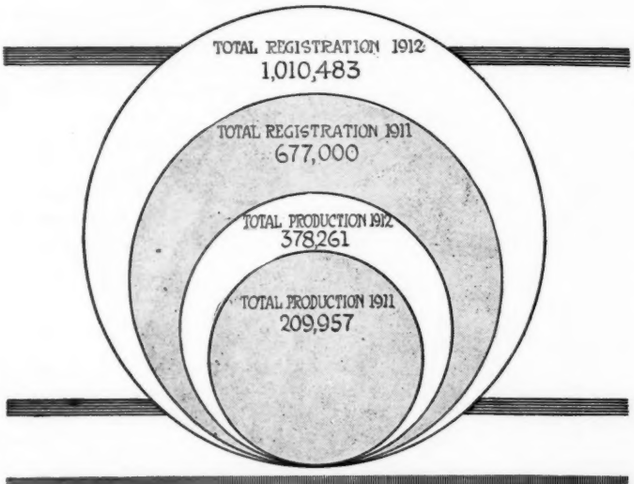
Car Registrations Now 1,010,483

This Figure Includes Duplicate Registration of 15,345
Makers' Statements Show Total Production of 378,261

By Donald McLeod Lay

GREAT as was the year 1911 in the annals of the automobile industry, the records established in registration and production of cars in the United States during that period have been surpassed by those created in 1912. The increasing interest which is manifested in the statistical reviews of the industry published from time to time in THE AUTOMOBILE rendered us especially desirous of securing as accurate figures as possible for our account of the progress made during the past year. For this reason, as well as because of the advantage of covering the entire year from January 1 to December 31 the annual article appears somewhat later than last year.

According to the figures given by the respective automobile registration officials of the various states the grand total of registrations this year, including pleasure cars and commercial vehicles of every description is 1,025,828. For the first time, however, THE AUTOMOBILE has been able to secure the number of duplicate registrations in each state, that is, the number of cars registered by non-residents. This amounts to 15,345, bringing the actual registration down to 1,010,483. The distribution of the cars throughout the union may be readily seen by referring to the table of registrations on page 329, in which the states are arranged alphabetically.

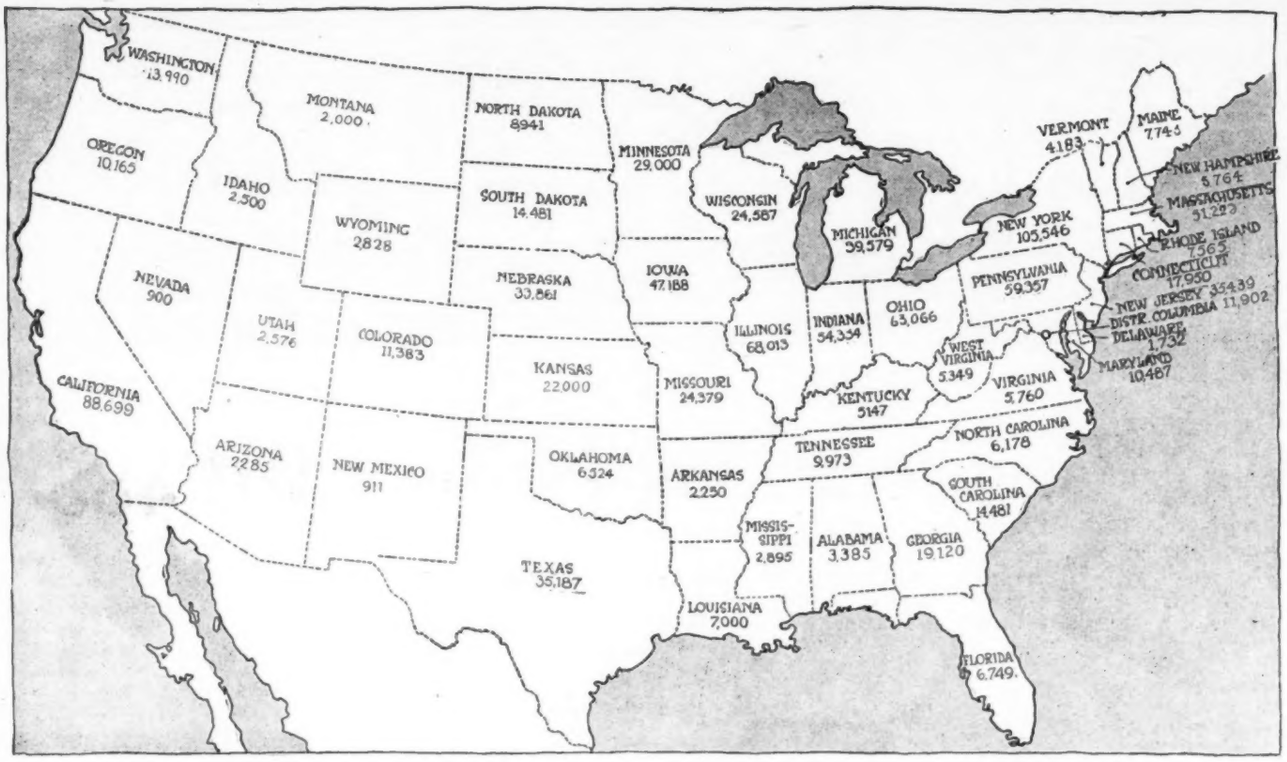


REGISTRATION IN EACH STATE

New York	105,546	Tennessee	9,973
California	88,699	North Dakota	8,975
Illinois	68,073	Colorado	8,950
Ohio	63,066	Maine	7,743
Pennsylvania	59,357	Rhode Island	7,565
Indiana	54,334	Louisiana	7,000
Massachusetts	51,229	Florida	6,749
Iowa	47,188	Oklahoma	6,524
Michigan	39,579	North Carolina	6,178
New Jersey	35,439	New Hampshire	5,764
Texas	35,187	Virginia	5,760
Nebraska	33,861	West Virginia	5,349
Minnesota	29,000	Kansas	5,147
Wisconsin	24,578	Vermont	4,183
Missouri	24,379	Alabama	3,385
Kansas	22,000	Wyoming	3,300
Georgia	19,120	Mississippi	2,895
Connecticut	17,950	Utah	2,576
South Dakota	14,481	Idaho	2,500
Washington	13,990	Arkansas	2,250
District of Columbia	11,902	Montana	2,000
Maryland	10,487	Delaware	1,732
Oregon	10,165	Arizona	1,624
South Carolina	10,000	New Mexico	911
Nevada	900		

The table shows the total registration of motor vehicles in the various states. Allowance is made for duplicate registration

In answer to a request for an estimate of the number of cars which each manufacturer expects to produce during the year 1913, the figures given by the makers indicate an extremely sanguine state of mind, the total being over 600,000. THE AUTOMOBILE,



Map showing actual registration of automobiles in 1912 in the various states, excluding duplicate registrations

Distribution of Dealers, Garages, Repair Shops and Supply Houses

State	Dealers	Garages	Supplies	Repairs	Total
Alabama	73	37	1	5	96
Arizona	45	22	2	1	58
Arkansas	45	22	....	2	55
California	853	515	26	54	1,133
Colorado	126	98	15	5	294
Connecticut	298	255	17	29	424
Delaware	33	22	....	3	37
District of Columbia	70	32	6	11	107
Florida	137	85	....	4	165
Georgia	188	99	6	7	238
Idaho	51	28	1	....	55
Illinois	851	677	34	61	1,309
Indiana	504	344	10	33	655
Iowa	773	483	1	21	974
Kansas	431	255	5	14	429
Kentucky	106	66	4	5	127
Louisiana	87	41	1	7	102
Maine	148	124	2	9	100
Maryland	120	70	6	6	146
Massachusetts	592	540	41	77	1,005
Michigan	485	321	20	28	523
Minneosta	471	235	14	22	567
Mississippi	50	35	1	4	68
Missouri	459	219	18	59	617
Montana	105	59	1	1	123
Nebraska	399	196	6	8	329
Nevada	32	12	....	4	40
New Hampshire	105	94	1	7	147
New Jersey	503	551	29	35	831
New Mexico	28	24	....	1	35
New York	1,355	1,287	107	120	2,174
North Carolina	118	64	1	9	92
North Dakota	159	116	....	5	242
Ohio	794	508	27	47	1,029
Oklahoma	121	69	2	5	161
Oregon	125	85	9	7	168
Pennsylvania	812	557	34	66	1,160
Rhode Island	85	85	5	17	149
South Carolina	92	65	2	5	127
South Dakota	176	94	1	6	207
Tennessee	130	52	4	8	148
Texas	335	140	6	17	411
Utah	36	15	2	8	50
Vermont	84	64	....	7	108
Virginia	147	77	3	7	178
Washington	199	86	9	14	250
West Virginia	82	37	....	1	93
Wisconsin	397	294	24	30	527
Wyoming	29	17	....	2	35
West Indies	1	1	....	....	2
Canada	301	227	10	7	358
Mexico	11	7	....	1	14
Total	13,408	9,299	559	779	18,547

however, regards this estimate as considerably in excess of the probable actual production which may reasonably be expected to amount to something between 400,000 and 450,000 cars. This figure is practically assured by the fact that one of the large companies has announced that it will increase its production by over 100,000 next year. The manufacturing facilities of this concern are such that this expansion is readily practicable.

In the statistical review of the industry published in THE AUTOMOBILE for July 25 it was predicted on page 165 that the value of the exports for 1912 would reach $25,000,000. This prediction was amply fulfilled. The total up to December amounted to the tremendous sum of $28,239,112, including automobiles and parts. This is an increase of $9,060,528. The imports of automobiles and parts, on the other hand, show a decrease in value of $147,275, the total for 1912 being $2,298,973. This indicates in a striking manner the increased appreciation of the American car by the American public.

In compiling the registration table on page 329 the figures given are those furnished by the registration officials of the various states excepting in Colorado, Idaho, Louisiana, Montana, Nevada and South Carolina, which have no provision for state registration of motor vehicles. The estimates for these states are based on population with reference to location and sectional registration and to estimates furnished by local authorities. The figures for Kansas, which also has no state registration, were obtained from the State Tax Commission, while those for Wyoming, also in the non-registrating class, came from the State Immigration Commissioner.

As before, New York leads the states in the number of automobiles registered, this time with a total of 105,546, none of which belong to non-residents. California is second with 92,199, but 3,500 of these are registrations of non-residents, which leaves only 88,699 actual registration. California has shown a big gain over last year, the difference being 29,497. This increase is greater than that of New York during the past year by 8,940. The great number of non-resident registration in California is readily explained by the large floating population due to so many residents of other states visiting the Golden State.

The states of New York and California, which have led all the others in automobile registration for several years are now not far apart in total registration. The growth of registration in the two states is graphically portrayed by the curve in the chart on page 331. The figures for New York state have been obtainable since 1901, but the chief point of interest in the curve is the sudden upward slant at 1903, which takes a more pronounced angle toward the vertical in 1909. The figures for California were not obtainable until 1910, but the curve indicates an even more rapid increase in the number of automobiles than in New York. It is interesting to note that the sharp upward slant beginning in 1910 on New York's curve is reflected in the equally positive direction of the California curve since 1911.

The number of automobiles registered in each state during the year 1912 as given in the table on page 329 is graphically illustrated in the diagram on page 332, as well as geographically in the map at the top of page 328, which shows the distribution of cars throughout the United States at the close of the year 1912.

Illinois stands third in the list with a registration of 68,073, an increase over last year of 29,969. This gain surpassed that of California for the year. Ohio is fourth with 63,066, which shows an increase of 17,327, and Pennsylvania fifth with 59,357, and a gain of 15,175. Indiana and Massachusetts are the only other states with a registration exceeding 50,000, the figures for Indiana being 54,443, or a gain of 17,508, and those for Massachusetts being 51,229, or a gain of 12,533. Massachusetts shows a non-resident registration of 858 over and above the figures given due entirely to its attractions as a touring state. Iowa is very close to 50,000 with 47,188, a gain of 19,252 over 1911. Michigan is ninth with 39,579, having increased its registration by 11,839, and New Jersey is tenth with 35,439. New Jersey shows a decrease of 12,827 over 1911 because of the fact that during 1912 it abolished the law requiring the registration of every non-resident automobilist who crossed its borders and fell into

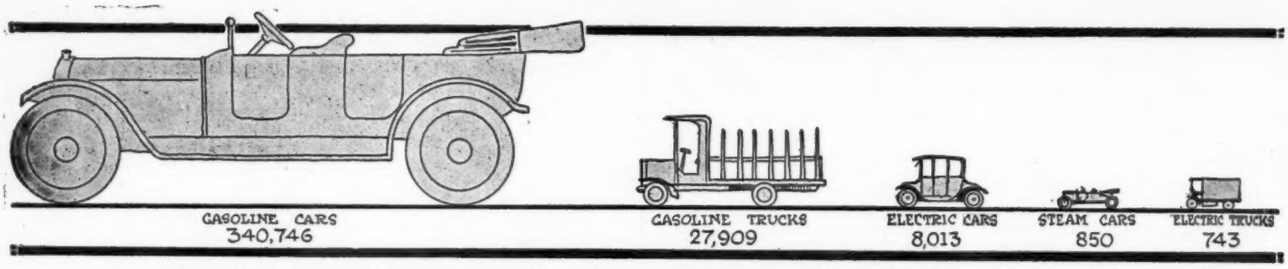
RELATION OF AUTOMOBILES TO POPULATION

State	Cars per 1000 population	Population per car
Wyoming	22.6	44
Iowa	21.3	47
Indiana	20	50
Massachusetts	17.1	59
North Dakota	15.4	65
Oregon	15.2	66
Michigan	13.9	72
Minnesota	13.9	72
Rhode Island	13.8	72
Ohio	13.2	76
New Hampshire	13.2	75.5
Kansas	13	77
Washington	12.2	82
Illinois	12	83
Vermont	12	85
New York	11.5	87
Colorado	11.2	89
Nevada	11	91
Wisconsin	10.5	95
Maine	10.4	96
South Carolina	9.5	105
Texas	9.1	110
Florida	8.9	112
Delaware	8.5	118
Maryland	8.05	124
Arizona	7.9	126
Idaho	7.7	130
Missouri	7.4	135
Georgia	7.3	136
Utah	6.9	145
Connecticut	6.7	151
Montana	5.3	188
Pennsylvania	4.6	216
West Virginia	4.4	228
Louisiana	4.2	238
Tennessee	4	249
California	3.94	254
Oklahoma	3.9	258
District of Columbia	3.6	278
New Jersey	3.4	292
Nebraska	2.8	351
New Mexico	2.8	360
North Carolina	2.8	360
Virginia	2.8	360
South Dakota	2.5	400
Kentucky	2.2	459
Alabama	2.1	495
Mississippi	1.6	622
Arkansas	1.43	700

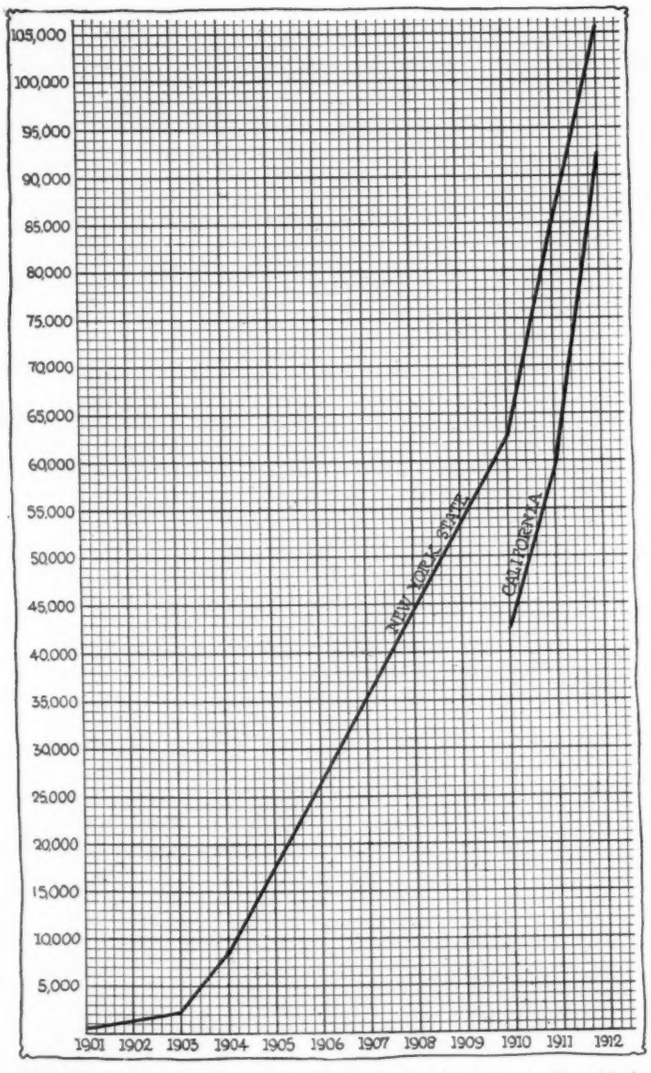
Automobile Registrations in Each State of the Union up to January 1, 1913, Together with the Number of Duplicate Registrations

State or Territory	Total Registration	New Registration 1912	Registration up to 1912	Gasoline Pleasure Cars in Use	Gasoline Trucks Cars in Use	Electric Pleasure Cars in Use**	Electric Trucks Cars in Use**	Duplicate Registrations*	Remarks
Alabama	4,400	1,554	2,856	4,200	100	100	.....	15	
Arizona	1,624	139	1,485	1,539	77	8	.....	.....	
Arkansas	2,250	.....	.....	2,187	50	12	1	.....	
California	92,199	32,997	59,202	81,599	7,000	3,000	600	3,500	Perennial registration
Colorado†	8,950	.....	.....	7,800	225	850	75	.....	No state registration
Connecticut	17,950	3,956	13,994	16,750	575	525	100	.....	
Delaware	1,732	341	1,393	1,607	100	20	5	.....	
Dist. of Col	12,689	4,367	8,322	11,914	250	500	25	787	Perennial registration
Florida	6,749	2,860	3,889	6,234	160	325	30	.....	Perennial registration
Georgia	19,140	6,900	12,240	182,80	400	400	60	20	
Idaho†	2,500	.....	.....	2,385	75	40	.....	.....	No state registration
Illinois	68,013	29,909	38,104	61,513	4,000	2,000	500	.....	
Indiana	54,334	17,508	36,826	48,484	3,900	1,800	150	.....	
Iowa	47,188	19,252	27,936	43,513	2,000	1,500	175	.....	
Kansas	22,000	8,000	14,000	20,900	500	500	100	.....	No state registration
Kentucky	5,147	2,279	2,868	4,897	200	40	10	.....	
Louisiana†	7,000	2,133	4,867	6,860	75	50	15	.....	Local registration
Maine	8,143	.....	.....	7,915	225	3	.....	400	
Maryland	10,487	3,117	7,370	9,607	700	150	30	.....	
Massachusetts	52,087	13,391	38,696	46,051	3,786	2,000	250	858	
Michigan	39,579	11,839	27,740	36,829	1,800	800	150	.....	
Minnesota	29,000	9,725	19,275	27,125	1,300	500	75	.....	
Mississippi	2,895	1,655	1,240	2,815	40	40	.....	.....	
Missouri	24,379	8,213	16,166	22,579	1,000	700	100	.....	
Montana†	2,000	.....	.....	1,950	50	20	.....	.....	No state registration
Nebraska	33,861	10,767	23,094	33,056	700	100	5	.....	
Nevada†	900	380	520	860	30	10	.....	.....	No state registration
New Hampshire	6,714	2,225	4,489	6,624	60	30	.....	750	
New Jersey	43,056	Decrease	48,266	41,406	1,000	400	250	7,617	
New Mexico	911	.....	.....	871	30	10	.....	.....	
New York	105,546	20,557	84,989	89,740	7,606	6,000	2,200	.....	
North Carolina	6,178	2,450	3,728	5,923	150	100	5	.....	
North Dakota	9,000	1,780	7,220	8,844	150	5	1	25	
Ohio	63,129	17,390	45,739	56,879	3,000	3,000	250	63	
Oklahoma	6,524	3,065	3,459	6,359	90	75	.....	.....	
Oregon	101,66	4,158	6,007	9,651	389	100	25	.....	
Pennsylvania	59,357	15,175	44,182	54,157	3,000	2,000	200	.....	
Rhode Island	8,565	2,548	6,017	7,516	759	250	40	1,000	
S. Carolina†	10,000	2,934	7,066	9,620	300	75	5	.....	Local registration
South Dakota	14,481	3,239	11,242	14,176	250	50	5	.....	
Tennessee	9,973	3,509	6,464	9,686	200	75	12	.....	
Texas	35.187	.....	.....	33,123	1,514	500	50	.....	
Utah	2,576	769	1,807	2,416	100	50	10	.....	
Vermont	4,283	1,036	3,247	4,141	100	40	2	100	
Virginia	5,760	1,844	3,916	5,573	125	50	12	.....	
Washington	14,000	5,411	8,589	13,445	400	125	30	10	
W. Virginia	5,349	3,258	2,091	5,195	100	50	4	.....	
Wisconsin	24,578	8,747	15,831	23,458	850	200	70	.....	
Wyoming	3,300	1,572	1,728	3,000	200	90	10	.....	Local registration (figures from State Immigration Commission)
Total	1,025,828	292,949	678,158	941,232	49,691	29,268	5,637	15,345	

NOTE.—800 steam pleasure cars are included among the gasoline pleasure cars. Dots indicate that previous figures were doubtful. *The number of cars registered belonging to residents of another state. **Some figures from state registration officials, balance from estimates given by local authorities. †Estimated on basis of population with reference to location and sectional registration.



Proportional diagrams showing production of various classes of motor vehicles during the year 1912



Graphs showing the sharp upward trend of registration in New York and California, the two leading states in this respect

line with the other states granting non-residents touring privileges for a limited time. At the present time the non-resident registration in New Jersey is 7,617 over and above the registration figures given.

The other states follow in order as given in the table on the first page of this article. It will be noted that there are only seven states with a registration of over 50,000; only nine with a registration of over 20,000, and eight with a registration of 10,000 or over.

With regard to the other states having non-resident registration, that in the States of Alabama, Georgia, North Dakota, Ohio and Washington is a practically negligible figure, as may be seen from the table on page 329. That in the District of Columbia, 787, is readily explained by the number of non-resident statesmen residing temporarily in the District, while the 1,000 in Rhode Island, the 950 in New Hampshire, the 858 in Massachusetts, the 400 in Maine, and the 100 in Vermont are due to the great number of non-residents spending their summers or making extensive tours in those sections of the country.

In considering the registration figures, it must be remembered that there are a great many cars sold as second hand each year, the change of ownership requiring the issuance of another license. Thus the same car may be licensed twice in the same year. It is impossible to secure figures on this, but it is some consolation to know that this is balanced to some extent by the many manufacturers and dealers who have several cars registered on a single license.

According to such figures as are obtainable and the estimates of registrating officials in the various states the total registration, 1,025,828, is made up of approximately the following: Gasoline pleasure cars, 941,232; gasoline trucks, 49,691; electric pleasure, 29,268; electric trucks, 5,637. The total non-resident registration amounts to 15,345.

With regard to the relation of the number of automobiles in each state to the population, as may be seen in the table on page 329, the figures given by the State Commissioner of Immigration place that state at the head of the list with one car to every forty-four of the population, or 22.6 cars for every thousand people. In view of this fact and considering the comparatively small population of the state it would indicate that either the citizens of Wyoming are very prosperous or else that the figures given are somewhat high. Iowa stands second in car-population ratio with a car to each forty-seven people, or 21.3 cars per thousand population, and Indiana third with an automobile to every fifty persons, or twenty cars per thousand. The other states all have less than twenty cars to each thousand of the population. In this connection it is interesting to note that some of the states with large registration are very far down on the list, Illinois being fourteenth, New York sixteenth, Pennsylvania thirty-third and California thirty-seventh. The state having the fewest cars per population is Arkansas, which has one automobile to every 700 people, or 1.43 cars per thousand population. The states having over eleven cars per thousand of the population are shown in the illustration on page 331. Three of these have over twenty cars per thousand; Massachusetts over seventeen cars per thousand; North Dakota and Oregon over fifteen cars per thousand; Michigan, Minnesota and Rhode Island over fourteen cars per thousand; Ohio, New Hampshire and Kansas over thirteen cars per thousand; Washington, Illinois and Vermont over twelve cars per thousand; and New York, Colorado and Nevada over eleven cars per thousand.

In securing the output figures of the automobile manufacturers of the United States for the year 1912 letters were sent to every manufacturer throughout the country requesting the total number of cars produced, the numbers of each type, and estimate on the probable number of cars to be built in his plant during 1913. Most of the makers answered at once, giving the figures desired, and a second letter or an interview sufficed to obtain practically all the information.

When we totaled the figures given by the various companies as their output for 1912 we found that the automobile manufacturers of the United States, according to their own statements, produced a grand total of 378,261 cars and that they estimated

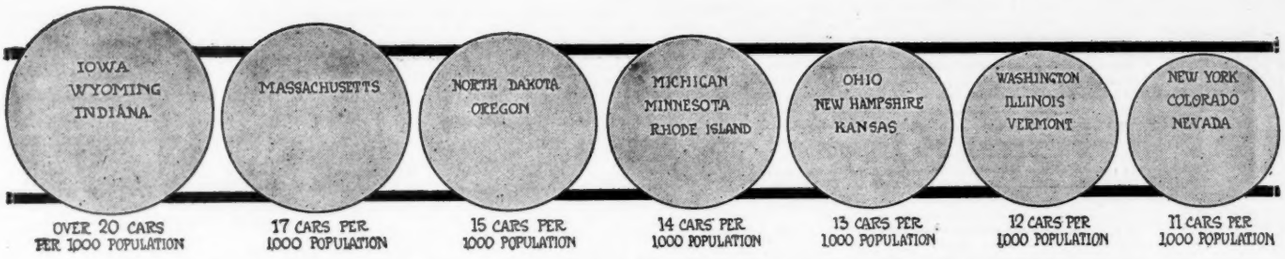


Diagram illustrating the popularity of the automobile in states having more than ten cars per thousand population

their output for next year at over 600,000, which, as has already been remarked, is probably at least 150,000 in excess of the number which will actually be turned out.

The grand total of 378,261 motor vehicles manufactured in 1912, according to the makers, is composed of 340,746 gasoline pleasure cars, 27,909 gasoline commercial motor vehicles, including some 200 fire department vehicles, 8,013 electric pleasure cars, 743 electric trucks and 850 steam pleasure cars. These compare with last year's figures as follows:

Types of cars built	1911	1912	Increase	Per cent. Increase
Gasoline pleasure	194,565	340,746	146,181	75
Gasoline trucks	8,500	27,909	19,409	224
Gasoline fire wagons	105	200	95	90
Electric pleasure	5,634	8,013	2,379	42
Electric trucks	553	743	190	34
Steam pleasure	600	850	250	42
Total	209,957	378,261	168,504	80

If the manufacturers' figures are correct, and it is reasonable to suppose that they are not very far off the track, the biggest features in the way of increased class production are the gasoline pleasure car and truck classes, the first showing a gain of 75 per cent. and the second, the more remarkable of the two, a gain of 224 per cent. The growing partiality of the merchants and business men of America to the motor truck is evidently already having a strong influence on the production of the factories, which must increase their output in proportion to the increasing demand. This, of course, necessitates the enlargement of manufacturing facilities, a great deal of which has been in evidence for the past year. The percentage gains in production during the past year have also been noteworthy in each of the other classes.

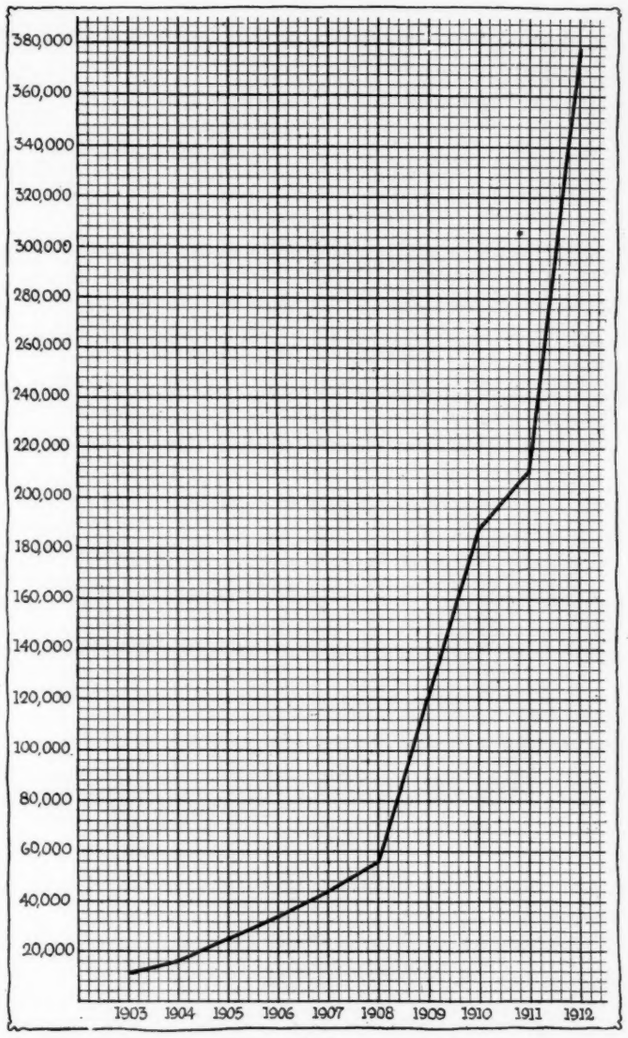
This year, for the first time, THE AUTOMOBILE was able to estimate the number of cars of various types produced selling at different prices during 1912, and has made an estimate of the number to be produced in 1913 in the same classifications. These are given in the table on page 332.

Disregarding the prediction for 1913 and dealing only with 1912, for which the figures are more reliable, we find that there were 164,678 gasoline pleasure cars produced to sell at $1,250 and under, the total amounting to $2,058,475. In the $1,250 to $2,000 class, 91,159 machines of this description were turned out, their sale netting the manufacturers $148,133,375. The $2,000 to $3,000 class was still more remunerative to the makers, the total of 61,179 cars amounting to $152,948,500. In the $3,000 and over class the sales of 23,730 cars brought the sum of $7,119,000.

Gasoline trucks selling at $1,250 and under were built during 1912 to the number of 12,885, which brought the manufacturers $12,885,000. In the second class, $1,250 to $2,000, 7,594 machines sold for $11,391,000 during the year. In the $2,000 to $3,000 class, 2,725 vehicles brought $6,812,500, while in the $3,000 and over class, 4,705 trucks sold for $14,115,000.

In the electric pleasure car field as well as in that of the electric trucks and steam cars, no machines were made to sell under $1,250. Taking the classification $1,250 to $2,000, 800 electric pleasure cars brought $160,000. In the $2,000 to $3,000 class, 4,487 cars sold for $11,217,500, while in the $3,000 and over class, 2,726 cars brought $8,178,000.

Electric trucks to the number of 292 were manufactured in 1912 to sell at $1,250 to $2,000, totaling $584,000. Those selling between $2,000 and $3,000 numbered 250, worth $625,000. There



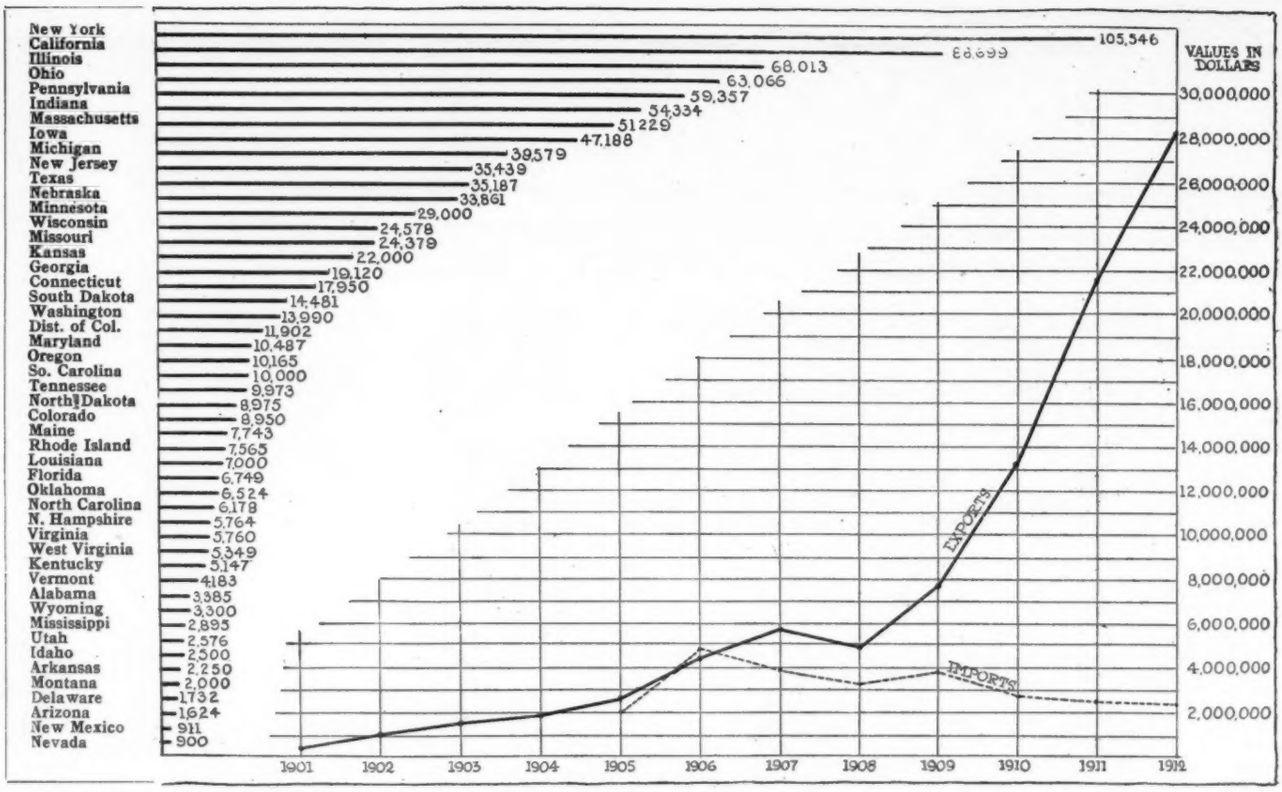
Annual production of automobiles for the past 10 years, shown graphically. The enormous increase during 1912 is clearly brought out

were only 201 electric trucks made to sell at $3,000 and over, but they brought $6[illegible]

There were 600 steam pleasure vehicles manufactured in 1912 selling between $1,250 and $2,000, the proceeds being $975,000, while in the $2,000 to $3,000 class, 250 steam-propelled vehicles brought 625,000.

The total number of cars produced in 1912 to sell at $1,250 and under was 177,563, representing a value of $195,000,000. Those made to sell from $1,250 to $2,000 numbered 100,445 and sold for $163,000,000. Cars made to sell between $2,000 and $3,000 amounted to 68,891 and had a selling value of $172,000,000, while those commanding more than $3,000 totaled 31,362 and represented an approximate aggregate sum of $12,500,000.

At the present time there is some hesitation on the part of



Upper diagram shows registration in the various states, arranged in numerical order. Lower curve shows values of exports and imports during the past 12 years

NUMBER OF MOTOR VEHICLES OF VARIOUS CLASSES PRODUCED IN 1912 AND ESTIMATED FOR 1913 CLASSIFIED ACCORDING TO PRICE—MANUFACTURERS' FIGURES

Price	Gasoline Pleasure		Gasoline Trucks		Electric Pleasure		Electric Trucks		Steam Pleasure		Total	
	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913
$1,250 and under	164,678	313,899	12,885	28,275	.....	.....	.....	.....	.....	.....	177,563	342,174
$1,250 to $2,000	91,159	113,035	7,594	18,321	800	2,080	292	510	600	635	100,445	134,581
$2,000 to $3,000	61,179	109,579	2,725	5,488	4,487	6,879	250	480	250	265	68,891	122,691
$3,000 and over	23,730	32,002	4,705	11,630	2,726	3,276	201	455	.....	.....	31,362	47,363
Total	340,746	568,515	27,909	63,714	8,013	12,235	743	1,445	850	900	378,261	686,807

the makers as to their immediate plans looking toward the 1914 season, largely on account of the uncertainty on their part as to what will be the policy of the new presidential administration. If the new president comes out emphatically in favor of good roads work throughout the country, the improvement of existing highways and the extension of cross-country routes, besides giving what the makers deem a reasonable tariff protection, the production of automobiles in the United States will be far greater than if the administration's policy should not coincide with these ideas. Just now the manufacturers are holding off somewhat, waiting to see what is going to happen.

In the export field, the makers of America acknowledge no superior in the number of cars shipped to foreign countries, although the automobile exports of France exceed those of the United States in value at the present time. It is expected, however, that within a year or two, the American manufacturers

IMPORTS OF AUTOMOBILES AND PARTS FOR 1909, 1910 AND 1911, AND FOR 11 MONTHS IN 1912

	1909		1910		1911		1912 to December	
	Number	Values	Number	Values	Number	Values	Number	Values
AUTOMOBILES	1,645	$3,071,002	1,024	$2,080,555	972	$2,098,481	1,795	$1,974,496
Imported from—								
United Knigdom	101	233,383	94	212,969	173	403,506	164	139,222
France	928	1,670,900	556	1,066,356	341	770,643	83	62,727
Germany	127	321,033	129	314,577	160	350,239	46	32,197
Italy	418	689,454	169	312,478	131	203,733	13	16,279
Other countries	71	156,232	76	174,175	167	370,360	1,489	1,724,071
Parts of (except tires)	.....	865,506	.....	656,653	.....	347,767	.....	324,477
Total	.....	$3,936,508	.....	$2,737,208	.....	$2,446,248	.....	$2,298,973

EXPORTS OF AUTOMOBILES AND PARTS FOR 1909, 1910 AND 1911, AND FOR 11 MONTHS IN 1912

	1909		1910		1911		1912 to December	
	Number	Values	Number	Values	Number	Values	Number	Values
AUTOMOBILES	4,686	$6,889,031	8,443	$11,210,295	15,807	$15,924,361	23,089	$23,998,351
Exported to—								
United Kingdom	.....	2,059,210	.....	2,755,592	4,021	3,380,266	4,371	3,302,918
France	.....	846,136	.....	753,204	420	449,757	668	502,040
Germany	.....	181,087	.....	331,754	115	124,615	438	348,398
Italy	.....	224,068	.....	377,750	176	199,986	267	240,715
Other Europe	.....	335,675	.....	764,463	795	718,360	1,439	1,178,847
Canada	.....	2,437,042	.....	5,021,043	4,987	5,549,998	6,864	8,255,134
Mexico	.....	494,238	.....	689,903	298	492,974	233	372,086
West Indies and Bermuda	.....	337,414	.....	412,588	300	343,281	316	331,230
South America	.....	240,453	.....	519,160	1,116	1,356,445	1,859	2,164,983
British Oceania	.....	303,452	.....	748,983	2,476	2,217,762	3,112	2,852,002
Asia and other Oceania	.....	191,448	.....	599,756	813	795,576	1,469	1,464,358
Other countries	.....	136,394	.....	216,150	280	295,341	2,053	2,985,637
Parts of (except tires)	.....	897,586	.....	1,980,001	.....	3,254,123	.....	4,240,771
Total	.....	$7,786,617	.....	$13,190,296	.....	$19,178,484	.....	$28,239,112

will lead the world in value of exports as well as in the number of cars shipped to foreign shores.

Glancing over the table on page 333, showing the exports of automobiles and parts from 1909 to December, 1912, the steady increase in the number of automobiles exported to the leading foreign countries serves to bring out the fact that the American manufacturer, with any representation across the water, is by no means entirely dependent upon his domestic sales. Canada ranks first as the greatest user of our cars, having imported 6,864 machines from the United States valued at $8,255,134 during the first 11 months of 1912. This represents an increase of about 3,000 automobiles as compared with the previous year and an increased valuation of nearly $3,000,000. Ranking next to Canada is her mother country, the United Kingdom, which, during the past 11 months, received 4,371 American-made cars, valued at over $3,000,000. The valuation of the machines exported to the United Kingdom appears to have fallen off slightly when compared with the figures for 1911, although the number of cars has somewhat increased. South America received 1,859 automobiles in the first 11 months of 1912, while the comparatively large number of 3,112 went to British Oceania.

The import statistics for the first 11 months of 1912 show a decreasing number of cars of foreign make coming to this country. England appears to be in the lead in exports of cars to the United States, having disposed of 164 cars valued at $139,222.

An interesting graphic representation of the variation in exports and imports of automobiles from 1901 to 1912 is shown on page 332. The phenomenal increase in exports is clearly indicated, and, except for the slight decline for the year 1908, the curve has a steady rise. On the other hand, the imports curve is gradually off, the peak having been reached in the year 1906, and, while there appears to have been some slight rejuvenation in 1909, the decline, on the whole has been steady.

Distribution of Automobile, Truck and Motor Manufacturers

	Automobiles	Trucks	Motors	Total
Alabama	1	.....	.....	1
California	6	6	.....	11
Colorado	2	3	.....	4
Connecticut	4	4	.....	5
District of Columbia	1	2	.....	3
Georgia	1	1	.....	2
Illinois	19	29	15	57
Indiana	38	17	9	58
Iowa	4	5	1	9
Kansas	1	.....	.....	1
Kentucky	1	3	.....	4
Maine	.....	1	.....	1
Maryland	4	3	.....	4
Massachusetts	13	12	.....	22
Michigan	56	58	11	104
Minnesota	5	10	1	14
Missouri	7	8	.....	11
Nebraska	3	2	.....	4
New Jersey	6	16	1	23
New York	25	47	16	81
North Carolina	1	.....	.....	1
Ohio	34	48	11	75
Oklahoma	1	1	.....	2
Pennsylvania	17	25	9	44
Rhode Island	2	3	1	5
South Dakota	1	1	.....	1
Tennessee	2	1	.....	2
Texas	1	2	.....	2
Virginia	1	2	.....	2
West Virginia	1	3	.....	4
Wisconsin	11	20	11	35
Canada	13	10	4	22
	282	335	77	604

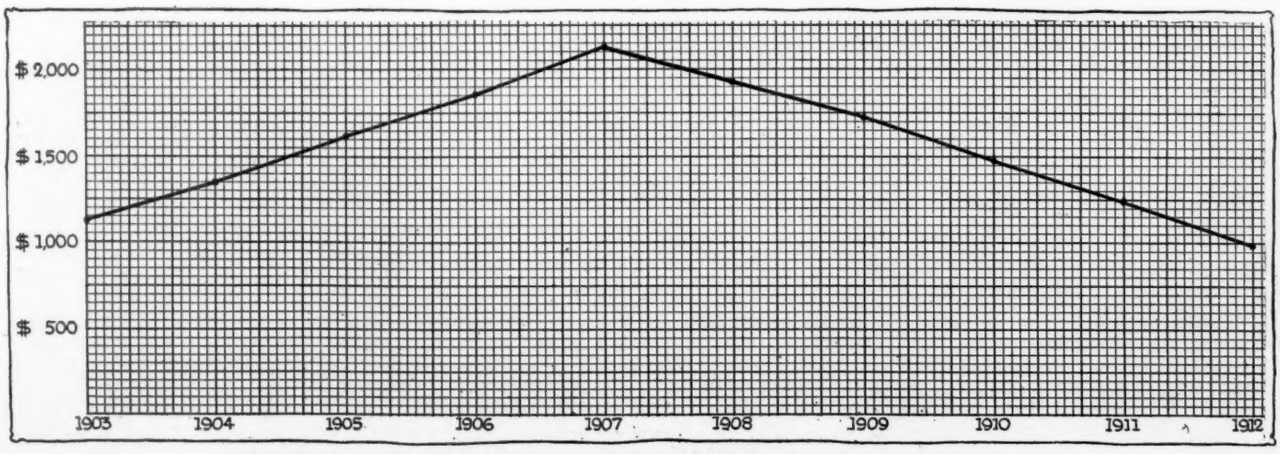


Diagram showing fluctuation in average price of American built cars from 1902 to date

Receivers for Knox

Involuntary Petition in Bankruptcy Filed Against Company by Three Creditors—Each Gave Bonds in $15,000

Under New Policy Company Will Follow Lead of Other Makers and Lessen Number of Models

SPRINGFIELD, MASS., Jan. 27—Last Monday an involuntary petition in bankruptcy was filed against the Knox Automobile Company by three creditors which comprised the Samuel Eastman Company, Concord, N. H., $38; the Hartford Automobile Parts Company, Hartford, Conn., $757, and the Platinide Company, Providence, R. I., $2. This led to the appointment of receivers for the company, comprising E. O. Sutton, H. G. Fisk and C. C. Lewis, who have been carrying on the plant since Mr. Mayo's death. They each gave bonds in $15,000. The real estate of the company was given as valued at $250,000 and the value of the motor cars now finished or in process of being completed as $750,000. Since these proceedings the three receivers have appeared before Judge Morton, in the United States District Court, at Boston, and after explaining the situation relative to the company the judge approved an order allowing them to issue certificates to the value of $25,000 in order that the business might not be interrupted just at this time. This will act as a temporary financing of the company and allow the completing of cars and trucks for spring delivery and also give the company a chance to continue on the show circuit as it planned until the other resources are secured. When the money it is expected to raise from some capitalists is received the name of the company will be changed in the reorganization to the Knox Motor Car Company.

Under its new policy the Knox company will follow the lead of other makers and lessen the number of models. This will give the company an opportunity to utilize its plant to greater advantage. The truck section of the company has been growing rapidly in recent years and much attention will be given to this part of the production. With the aid of new capital to turn over the product now in course of construction and to increase production later the outlook for the company is much brighter than it was last year.

Yearly Dividend Reports

The Willys-Overland Company will pay an initial dividend of 1.5 per cent. on its newly issued common stock, on February 1. The Lee Tire & Rubber Company, Conshohocken, Pa., is declaring a half-yearly dividend of 3.5 per cent. on its preferred stock. The Buick Motor Company gave out its report on the year of 1912, during which the liabilities and assets, being equal to each other, were $12,271,200. The surplus of assets over liabilities for 1912 was $6,594,318, or $90,628 more than the surplus in 1911, which was $6,503,690.

Kelsey Sues Lycoming Foundry

HARTFORD, CONN., Jan. 25—Receivers of the Kelsey Motorette Company, Hartford, Conn., have brought suit against the Lycoming Foundry & Machine Company, of Williamsport, Pa., alleging breach of contract. The action is returnable in Pennsylvania.

Franklin Officers Are Elected

SYRACUSE, N. Y., Jan. 25—The H. H. Franklin Manufacturing Company and the Franklin Automobile Company, its selling organization, held their annual meetings Wednesday. John Wilkinson was elected vice-president of the H. H. Franklin Manufacturing Company, to succeed Giles H. Stilwell, and Mr. Stilwell was chosen vice-president of the Franklin Automobile Company in place of Mr. Wilkinson, the exchange occurring because since the preceding elections Mr. Wilkinson has become general manager of the manufacturing company, which owns the automobile company, the selling agency for Franklin cars. The manufacturing company's stockholders re-elected the following directors: H. H. Franklin, Mr. Wilkinson, Frank A. Barton, Mr. Stilwell, Edward H. Dann, Alexander T. Brown and Willard C. Lipe. The directors in turn elected Mr. Franklin president, Mr. Wilkinson vice-president and Mr. Barton secretary and treasurer. No change was made in the automobile company's officers, who are the same as for the other corporation, except the vice-presidency, and the fact that Messrs. Brown and Lipe are not members of the board.

Cox Not Infringing on Rose

Judge Hazel, in the United States District Court, Southern District of New York, rendered a decision in the case of the Rose Manufacturing Company, Philadelphia, Pa., vs. the Cox Brass Manufacturing Company, Albany, N. Y. The decision brought out the weakness of the patents owned by the Rose company, in a similar manner to the decision of Judge Cross rendered about a week ago. The lamp bracket made by the Cox company being the subject of the Rose complaint, Judge Hazel ruled that that bracket was quite different from the product of the complainant.

Big Attendance for Road Convention

From present reports the indications are that each of the forty-nine states will be represented, when the second Federal Aid

Automobile Securities Quotations

The developments of this week consisted principally in a falling off of the prices of tire stocks which had risen during the past few months. Among the stocks subject to this effect were: Ajax-Grieb common which fell 20 points and Miller, 10 points. International Motor preferred fell likewise, 15 points. On the other hand, Firestone common soared 23 points and Chalmers rose 5. The tone of trading was firm.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	..	..	160	185
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings Co., pfd	..	..	99	101
American Locomotive Co., com	34	35	39	40
American Locomotive Co., pfd	103	103½	104	106
Chalmers Motor Company	..	..	135	143
Consolidated Rubber Tire Co., com	5	10	19½	21½
Consolidated Rubber Tire Co., pfd	10	25	70	80
Firestone Tire & Rubber Co., com	..	..	357	365
Firestone Tire & Rubber Co., pfd	..	..	105	107
Garford Company, preferred	..	..	100	102
General Motors Company, com	34½	35½	33	34½
General Motors Company, pfd	77½	78½	76	78
B. F. Goodrich Company, com	..	..	63	63¾
B. F. Goodrich Company, pfd	..	..	104	105
Goodyear Tire & Rubber Co., com	250	260	445	452
Goodyear Tire & Rubber Co., pfd	104	106½	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	25	50
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	40	44	32	34
Pope Manufacturing Co., pfd	67	70	76½	78
Reo Motor Truck Company	8	10	11½	12
Reo Motor Car Company	23	25	20½	21¼
Studebaker Company, common	..	..	34	35½
Studebaker Company, pfd	..	..	92	94
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	100	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
U. S. Rubber Co., com	..	..	65½	66
U. S. Rubber Co., pfd	..	..	107	107¼
White Company preferred	..	..	105	108
Willys-Overland Company, com	..	..	70½	71½
Willys-Overland Company, pfd	..	..	98	99

Good Roads Convention, called by the A. A. A., takes place in Washington, D. C., on March 6 and 7. So far more delegates have announced their intention of attending the convention than the total attendance of last year. This is accounted for to some extent by the fact that the inauguration will be held on March 4. But the good roads movement itself has become so widespread, that a successful and enthusiastic convention is assured.

Twenty-nine governors have already appointed delegates to represent their respective states at the convention and the boards of trade of the larger and more prosperous towns throughout the country have also appointed delegates. Groups of delegates from chambers of commerce and State trade organizations help to swell the numbers, and these taken in connection with the large groups of delegates from good roads organizations, the forty-five State organizations and more than 500 local clubs which are constituent bodies of the A. A. A. will make a record-breaking and enthusiastic crowd. In fact, indications point to a successful session.

Columbus Buggy Affairs Straightening

COLUMBUS, O., Jan. 27—Steps have been taken by the preferred stockholders of the Columbus Buggy Company, of Columbus, O., which was thrown in the hands of Daniel McLaren as receiver recently, to protect their interests and a meeting will be held January 30 for the purpose of organizing. In all there is $132,800 preferred stock issued and $700,000 common stock.

A committee consisting of John G. Deshler, a banker of Columbus, W. D. Brickell, a capitalist, and H. B. Peters, of Lancaster, O., will take up the question of looking after the interests of the preferred stockholders. It is believed that after paying all claims the preferred holders will be protected. Assurances are given that the plant will continue in the field of automobile manufacturing.

Market Changes for the Week

Tin proved to be the most important change in the markets of last week, starting at $50.50 on Wednesday, a gradual decline in price resulted ending on Tuesday at $49.90 per hundred pounds, due to a light demand. The prices were irregular for electrolytic copper in the domestic market, closing at a loss of $.008 1-8 for the week. Lead remained quiet but steady, closing at $43.30 per hundred pounds. Antimony was weaker, due to poor trade, and closing at $.08 1-4 per pound. The situation in the local market for scrap market underwent no change last week. Domestic rubber is still moving into consuming channels in a moderate volume, and there has been no increase in supplies. Cottonseed oil was steady, due to a short covering in January.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb...	.08¾	.08¾	.08¾	.08½	.08¼	.08¼	—.00½
Beams and Channels, 100 lbs.....	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	.....
Copper, Elec., lb..	.16¼	.16⅜	.16⅜	.16⅜	.16¼	.16⅛	—.00⅛
Copper, Lake, lb..	.16⅜	.16½	.16⅜	.16⅜	.16⅜	.16⅜	.....
Cottonseed Oil, October, bbl....	6.31	6.30	6.30	6.29	6.27	6.24	—.07
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	.....
Fish Oil (Menhaden)	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals. @.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime....	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.....	4.30	4.30	4.30	4.30	4.30	4.30	.....
Linseed Oil.....	.47	.47	.49	.49	.49	.49	—.02
Open-Hearth Steel, ton.....	29.00	29.00	29.00	29.00	29.00	29.00	.....
Petroleum, bbl., Kansas	.83	.83	.83	.83	.83	.86	+.03
Petroleum, bbl., Pa., crude.....	2.05	2.05	2.05	2.10	2.19	2.19	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw Ital.....	....	4.35	....	....	....	4.35	.....
Silk, raw Japan....	....	3.72½	....	....	....	3.70	—.02½
Sulphuric Acid, 60 Beaumé.....	.99	.99	.99	.99	.99	.99	.....
Tin, 100 lbs.....	50.50	50.00	49.98	49.95	49.90	49.90	—.60
Tire Scraps.....	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.....

Fisk Company Expands

Recent $400,000 Addition to Company's Plant To Be Supplemented by Further Increase of Manufacturing Facilities

Personal of the Organization Will Remain Unchanged and Present Business Policy Will Be Continued

OWING to the rapid increase of business, the Fisk Rubber Company, Chicopee Falls, Mass., is arranging for a considerable increase of capital with the purpose of expanding its manufacturing facilities. The $400,000 addition to the company's plant which is now nearing completion will be supplemented by further improvements. Sidney S. Meyers, counsel for the company, states that the increase of capital is to be made solely on account of the enlarged facilities necessitated by the company's growth. The personnel of the organization will remain unchanged, H. T. Dunn retaining the presidency and H. G. Fisk the treasurership. The business policy of the company will be continued unaltered. A more detailed announcement of the company's plans will be made in the near future.

Maxwell Reorganization Progressing

The process of reorganizing the former United States Motor Company into the Maxwell Motor Company, Inc., is progressing rapidly and Sidney S. Meyers, counsel for the company, states that the securities and cash to be taken by the various classes of creditors, according to the agreement made at the time of reorganization, will probably be forthcoming by February 15. The company has moved its executive force to the United States Tire building.

Rubber Again Weakens

The principal topic in the rubber trade was the outcome of the auction of plantation rubber which was held in London. The sale went off at lower prices. There was a good demand, according to cables recently received, but the offerings were large.

Colt Defends Rubber Stock

The following statement was given out Jan. 27 by Samuel P. Colt, president of the United States Rubber Company:

"Judging from newspaper articles to which my attention has been called, several matters in the recent application of the United States Rubber Company to list additional common and first preferred stock were misunderstood. As stated in the application, which has been duly granted by the authorities of the Stock Exchange, $6,000,000 additional common stock is to be given in exchange for the entire common stock of the Rubber Regeneratnig Company.

"It is only fair that our stockholders should know at this early date that the entire earnings of the United States Rubber Company for this fiscal year promise to be largely in excess of dividend requirements. The earnings of the Rubber Generating Company are now double the dividends on the amount of the United States Rubber Company common stock issued in exchange for the corresponding issue of that company. Furthermore, the United States Rubber Company will undoubtedly, aside from earnings, be indirectly benefited to a large extent by the acquisition of the Rubber Regenerating Company.

"There seems to have been some misapprehension as to the amount of surplus shown in the statement of the United States Rubber Company to the Stock Exchange for the six months ended September 30, in comparison with the surplus shown as of March 31 last, in the annual report. Apparently it has been overlooked that in the meantime the company has declared and paid a stock dividend of $5,000,000 to its common shareholders. Obviously the surplus was reduced by that amount.

"To my mind the important point in this whole matter is that which I have already referred to, namely, that the earnings of the United States Rubber Company promise to be largely in excess of all dividend requirements."

Coleman Not to Resign

Contrary to the rumor which has been circulated recently throughout the trade, C. T. Coleman, president of the International Motor Company, New York City, has no intention of resigning from that office. Mr. Coleman and the other officers of the company denied this report emphatically.

Albany Active on Motor Legislation

Shows Throughout the National Circuit Report Good Progress—Many Exhibits Are Promised

Pelletier to Handle Accounts of Maxwell and Also Those of Splitdorf Starter and Other Accessories

FOLLOWING is an amendment to the highway law introduced by Mr. Wilson in the Senate of the State of New York, read twice and ordered printed, and when printed to be committed to the Committee on Internal Affairs:

§ 329-a. *Lights on vehicles. Every vehicle on wheels whether stationary or in motion, while upon a public highway or bridge shall have attached thereto a light or lights, to be so displayed as to be visible from the front as a white light and from the rear as a red light from one hour after sunset to one hour before sunrise; provided, however, that this section shall not apply to a vehicle designed to be propelled by hand or to any vehicle while the same is upon any lighted street or highway if the street lights are maintained at a distance of not more than five hundred feet apart, or to a vehicle designed principally for the transportation of hay or straw while loaded with such commodities. Upon the written application and presentation of reasons therefore by the owner of the vehicle, the state commission of highways may in writing, and subject to such requirements as it may elect to impose, but without expense to the applicant, except said vehicle from the provisions of this section for such period of time as the commission may determine. Nothing in this section shall be construed to affect the provisions of any existing statute, rule or regulation requiring lights on motor vehicles or affecting the obligations of operators or occupants thereof. A person violating the provisions of this section shall thereby incur a penalty of five dollars for each violation, to be recovered by the said town or village in which the violation occurs.*

Pelletier Takes Several Accounts

LeRoy Pelletier, who recently severed his connection with the Flanders Motor Company, Detroit, has been engaged by the new Maxwell Motor Company, Inc., the successor to the United States Motor Company, to write and handle the organization's advertising, according to a statement made by Walter E. Flanders, the new president of the Maxwell company. Mr. Pelletier is not to be known as advertising manager, but rather as advertising counselor. He will have his own headquarters separate from the Maxwell plant.

Mr. Pelletier has also been engaged by John Splitdorf to handle the advertising of a new concern which is to market an electric cranking apparatus to be brought out soon. He will also act for a tire company, the name of which has not been announced.

Safety Museum Publishes Booklet

The American Museum of Safety has brought out another small pamphlet devoted to the danger to children playing in the street. The attention of the little ones is called, in this publication, to the risk they run in playing tag, blindfold or never-touched-me, in a street where automobiles abound. Simply, but effectively, the pamphlet brings out the fact that the pleasure of playing a dangerous game is by far over-balanced through the chance of being killed or maimed by a vehicle. THE AUTOMOBILE co-operated with the Museum in producing the booklet.

Detroit Show Is in Full Swing

DETROIT, Jan. 28—With more floor space, more cars of every variety, more complete decorations and a larger accessory section than last year, the twelfth annual show of the Detroit Automobile Dealers' Association was opened to the general public in the Wayne pavilion and annex Monday night. The annex, which probably will remain as one of Detroit's show buildings, is 173 x 124 feet across Front street from the main pavilion, and gives the exhibit more than 10,000 more feet of space for exhibits than in 1912.

At the Detroit show 42 makes of gasoline pleasure cars are exhibited, each manufacturer showing several models, thus making the number of models on display something like 300.

The show marks the entry of Detroit into the National circuit, which now, besides Detroit, comprises eleven large cities of the country. For this reason many of the exhibits were brought direct from the New York show.

8,000 Attended Buffalo Opening

BUFFALO, N. Y., Jan. 28—Buffalo's eleventh annual motor show was auspiciously opened last evening at 8 o'clock when President George Ostendorf of the Buffalo Automobile Dealers' Association, under whose auspices the annual exhibition is being given, escorted Acting Mayor Burley.

The show is being held in the Broadway Auditorium, and is the result of weeks of effort and preparation. Seventy-five exhibitors are showing cars at the hall, and the approximate value of the cars on exhibition is said to total $2,500,000. About 8,000 were in attendance on the opening night.

Over 200 Cars at Newark Show

NEWARK, N. J., Jan. 25—With a record-breaking entry of more than 200 cars, of both the pleasure and commercial types, comprising no less than fifty-three separate and distinct makes, the drawings for space at the Newark Automobile Show were held Friday. In addition to those entries already in hand, there are several others still to be heard from, which will bring the list up to an even greater figure. The space in the huge First Regiment Armory, where the show is to be held during the week of February 15-22, was more than over-subscribed, but by the curtailment of the number of spaces that would be allotted to any one firm, the space committee arranged for several more exhibits.

Take Nothing from Maxwell Plant

INDIANAPOLIS, IND., Jan. 27—Judge Albert B. Anderson of the United States District Court for the district of Indiana has issued an order restraining the receiver, agents or employees of the Maxwell-Briscoe Motor Company from removing any of the property of the company at Newcastle from the jurisdiction of the court or from the place where it is now situated.

The restraining order was issued at the request of a number of Indiana creditors who recently brought action to have the company adjudged bankrupt. The restraining order, however, does not interfere with the transfer or sale of the property as recently ordered by the United States District Court for the southern district of New York.

Older Chauffeurs May Be Required

An act has been introduced in the Senate of the State of New York to amend the highway law to read that "no person shall operate or drive a motor vehicle who is under twenty-one years of age, unless such person is accompanied by a duly licensed chauffeur or the owner of the motor vehicle being operated."

Jerseyites Against Fee Increase

The members of the North Jersey Automobile Club passed a resolution on January 20, to protest against the increase in license fees proposed by Commissioner Lippincott. The reason of the protest is that the fees were raised 50 per cent. last year, besides a personal tax to the full value of their cars.

Organize To Fight High Gasoline Prices

New York Garage Association Sets Movement on Foot To Combine Efforts For Concerted Action

Purposes of Nineteen Thirteen Club Explained to Garage Association as a Ways and Means Committee

WHAT may be the beginning of a country-wide movement has been launched by the New York Garage Association. The fuel situation has aroused the indignation of a number of scattered organizations and it is the purpose of the garage men to combine these efforts into a concerted movement which will be productive at least of a thorough understanding of the subject.

At the annual dinner of the association held Tuesday night 200 garage owners were in attendance. Captain Louis J. Joscelyn presided. The enthusiasm of this body of men and their determination to make use of every means at their disposal to force the fuel situation to an issue was evidenced by the speakers, who insisted that a combined effort is necessary. Alfred E. Ommen, formerly City Magistrate, was the first speaker. He dwelt at length on the grip that the Standard Oil Company has on the industry in this country and how futile the efforts of one or two hundred garage men are against the mighty influence exerted by this immense institution whose profits are such that its stock sells for over $600 a share.

William R. Gulik, a chemist of Princeton University, was the next speaker. He said that the question is entirely one of supply and demand and that the price is bound to soar. He ventured the prophecy that there never would be cheaper gasoline and that the solution lay in a new fuel. Mr. Gulik has invented a fuel which he states will supplant gasoline.

Edward W. Mitchel, of the Hydrocarbon Products Company, announced that his concern has perfected a new process of refining which reduces the cost of production to an enormous extent. He stated that if he were assured of the patronage of the garage dealers of New York City, who represent the sale of 10,000,000 gallons of gasoline annually, his firm could put up a refinery which would produce gasoline to be sold at a price much lower than that now charged the consumer. Congressman Baker also spoke on the Turner process used by the Hydrocarbon company and stated that many oil fields at present unavailable on account of the large percentage of asphaltum could be made of use. Even Bermuda oil, which contains between 50 and 60 per cent. asphaltum, has been refined by the process, according to Congressman Baker.

Purpose of the Organization

T. H. Cochran, a political economist, said a few words in regard to the Nineteen Thirteen Club and its purpose, which is outlined in the following bulletin:

The First Nineteen Thirteen Club.

No Officers. No Dues. No Fees

Simply a *"Ways and Means Committee"* which will attend monthly meeting for the purpose of discussing a fully developed and specifically defined plan or other plans that may be suggested for the solution of many serious business problems now confronting the nation.

There is every indication that the year 1913 will be an eventful and prosperous one for the American people, provided every legislative representative without regard to political faith will heed the voice of the businsss men of the country for the general welfare.

The various questions affecting the economic progress of the country, business men as well as theorists differ, and as these questions to be correctly settled must be settled by business men, we hereby agree to join the above named club for the discussion of economic problems, to the end that our views may be of weight in the working out of practical business reforms through Congressional and executive action.

This organization, which is now registered with the county clerk of New York, will shortly incorporate under the laws of the District of Columbia, and then will charter state and sub-organizations. The attention of the organization is concentrated on the petroleum problem at the present time but will later spread to all industries, according to the plan of organization.

A meeting has been called for next Tuesday evening when the co-operation of the garage organization with the Ninteen Thirteen Club will be discussed along with the best means of getting an organized body into action.

Among the other guests and speakers at the banquet were the Hon. Earle Moore, of the Municipal Explosives Commission, who dwelt on the desire of the commission to meet the question of the installations of garage separators in a fair manner; Charles R. Zacharius, Theo. K. McCarthy, counsel for the organization; William Burrows, Wm. R. Haradon and Arthur M. Giegerich.

Aluminum Company's Wages $101,375

MANITOWOC, WIS.—The Aluminum Goods Manufacturing Company, Manitowoc, Wis., in making its annual accounting to the Citizens' Association of Manitowoc, which assisted in financing the enterprise, showed that there was an increase of more than 105 per cent. in wages paid during 1912 and of 60 per cent. in the number of employees during the first year. The requirement of the association in lending its aid was that the company guarantee to expend $350,000 in wages in the first 6 years of operation. During the first year, 1912, there was expended in wages $101,375. The payroll numbers 300 men.

Massachusetts Accidents in 1912

BOSTON, MASS., Jan. 25.—Police Commissioner Stephen O'Meara of the Boston Police Department has just compiled his annual report and a part of it is devoted to the traffic regulations and the use of motor cars in the city. The commissioner goes back into history and recites that the first instance of a prosecution of a motorist occurred 11 years ago when a man was convicted for driving without a permit in a public park. Since that time the prosecutions have increased to such an extent that the total for 1912 was 2170, showing an increase of 271 over 1911. Commenting upon accidents, the first report of which was made in 1900, the commissioner says:

"After long and careful personal observation, the daily study of complete official reports of accidents and prosecutions, and an extensive experience with complaints by and against owners and drivers of automobiles, I have formed opinions which I express as follows:

"The leap in four years, from six killed and 127 injured in Boston in 1908 to 22 killed and 483 injured in 1912 cannot nearly be accounted for by the increased use of motor vehicles, large though that increase has been.

"I believe that the principal cause of the growth of the list of killed and injured is the increase in the average speed of motor vehicles. To the same cause may be charged an enormous amount of anxiety, inconvenience and delay suffered by the walking public.

"In the past five years the police of Boston have made more than 10,000 prosecutions under the automobile laws. No one can say that they have been without effect. Doubtless they have placed some restraint not only upon the persons prosecuted, but upon many owners and drivers of automobiles who have never been before the courts. But to say that they have secured a general obedience to the law, or even obedience in a reasonable degree, would be to say what everybody knows to be not true.

"The small fines imposed by the lower courts are paid, or the cases on appeal disappear in the mass of business with which the Superior Court is required to deal."

The American Motors Company, Indianapolis, Ind., has formally entered two American cars in the Indiana Automobile Manufacturers' Association tour from Indianapolis to San Francisco.

Two new entries have been received for the Speedway race at Indianapolis on Memorial Day—a Nyberg and a Keeton. The Nyberg will have 389 cubic inches piston displacement and will be driven by Harry Endicott. The Keeton car will be driven by Bob Buman, who is going to reduce the weight of the chassis to 1,600 pounds for the contest.

One of the principal items in the coroner's report for 1912 showed that during this year in the boroughs of Manhattan and the Bronx, New York City, there were a total of 2,712 deaths by violence. Out of this number 146 were killed by automobiles. The coroner's office has represented strongly to the legislative authorities the necessity for stricter automobile laws, in the belief that a large percentage of the deaths were preventable. Fifty-one people, a woman among them, were arraigned for deaths by automobiles. Of these, four were held for the grand jury.

Col. E. F. Glenn, of Twenty-third Infantry, stationed at Fort Benjamin Harrison, has completed his plans for transporting that regiment from its station to the Pacific coast and back again, using motor trucks in the transportation. Each truck could carry eighteen men with their baggage and equipment. Additional trucks would be used for transporting oil, gasoline, extra tires, parts, etc.

Guatemala Has 200 Cars

All Are Owned in Guatemala City as Roads Throughout the Country Are Exceedingly Poor

None Were in the Country 4 Years Ago—Streets and Roads of Capital Are Good

GUATEMALA City, capital of the Republic of Guatemala, has 200 automobiles, but aside from those owned in the capital there are not five in the whole country. The reason is that the only roads serviceable for automobile use are those in and radiating from the city.

There are two taxicab systems in operation, using about ninety cars, and the remainder are privately owned. Taxicab rates are $50 an hour, which is quite reasonable when the rate of exchange, eighteen to one, is considered. There are two public garages where a majority of the cars are stored although several private owners have garages of their own.

German, French and a few American automobiles constitute the motor equipment of the city. The roads are very good, where they are good at all, and the use of the automobile is growing steadily. In fact there were no automobiles in Guatemala 4 years ago, and the present number really represents the growth of but 3 years.

Price of Gasoline Is Very High

The customs duties on cars and parts are 20 cents per kilogram (2 1-5 pounds). This tax is divided half and half between gold and Guatemalan currency, which makes the duty about 10.5 cents per kilogram. Thus on an automobile weighing 4,000 pounds, the duty would be about $190. But gasoline is very high, not only on account of the long transportation required, but because of the heavy duty imposed. The Guatemalan government exacts a tax of 5 cents per kilogram, half in gold, which amounts to about 5.8 cents per gallon, a trifle more in fact. This makes the wholesale price of gasoline about 32 cents, gold.

Treibel & Company, founded by an Americanized German, was the pioneer in the field and today represents five or six American factories and a foreign car or two. This house is in general merchandising.

La Perla, said to be the largest jewelry house south of the United States handles a number of foreign makes.

So far, the business in Guatemala City is too small to warrant exclusive automobile agencies. The city has a population of 110,000 and the people generally are prosperous and able to afford cars.

William C. Smith, Guatemala City, in speaking of the present disadvantages of American business men in trading with Guatemala and other Latin-American countries as compared with the favor of Germany, France and England, said:

"Careless packing, curtness in business communications and an all around disregard for the wishes and customs of Latin-America, are the chief elements that stand against the growth of American business in Guatemala and elsewhere in Central and South America.

"In the matter of packing, there is excellent reason why the Guatemalans want it done in a certain way. Take for instance, a shipment of general supplies for a plantation located in the foothills away from the railroad which spans the continent between Porto Barrios and San Jose. We will assume that the shipment weighs 10,000 pounds. If it has to be transported by mule back, it is necessary to have the parcels limited to 200 pounds each. Just before I left down there, such a shipment was received by a planter. He had ordered it from the United States and had specifically instructed the shippers to divide the parcels so that they could be handled by mules. Instead, the whole consignment arrived in bulk.

"Now the result was that the consignee was obliged to ship the goods by rail to Guatemala City, repack them according to his ideas and trans-ship them to the railroad point from which the mule train made its start. As it affects the United States, I can say with certainty that never again will this particular good buyer purchase goods in this country.

"Not only were his specific instructions disregarded, but when he inquired why such action was taken, he was curtly informed by letter that the company making the shipment could not be bothered with such unusual procedure.

"I recall another case where a mirror for the chief hotel was ordered from San Francisco. Of course, it was insured in shipment, but on three occasions mirrors to fill that order were broken on account of the lack of care taken in packing. The customer finally became wearied and ordered his mirror from Germany, receiving it in perfect condition at the first trial.

"I have seen bolts of cloth into which nails were driven in packing, ruining 10 yards or more.

"The results of all these things, carried on over a period of years have led to German commercial supremacy. This is a bad thing from the viewpoint of the United States and also Guatemala, because the great coffee plantations which are the backbone of international commerce are owned by non-resident Germans in large proportion who simply maintain working forces on the plantations, doing all business at Hamburg. The coffee is grown and shipped down to the coast and supplies are shipped back. The pay-roll is prepared in Hamburg. Aside from the comparatively small return for labor, not a cent of the coffee money reaches Guatemala. Recently the government added 1 cent a pound to the export tax in an effort to get back a share of the profits.

"The climate of Guatemala is different from other low-lying tropical countries. Geographically the republic is divided by the main continental mountain range. On either coast there is a low belt of land which from Colombia to Corpus Cristi has been noted for its unhealthfulness.

"Yellow fever has been a periodic scourge for many years, until about 7 years ago when the last visitation occurred. After that time President Manuel Estrada Cabrera has succeeded in stamping it out. The United Fruit Company which controls millions of acres of agricultural land along the coasts followed the suggestions of the United States officers who had studied the question of febrile hygiene and concluding that the mosquito was at the bottom of the epidemic, screened the open water within its jurisdiction and took other means to suppress the growth of the mosquito and the result is to be seen in the fact that for 7 years there has been no yellow fever in Guatemala. In the capital the climate precludes the possibility of fever on account of the altitude and it has never been considered a danger, but on the coast there has been a very different story to tell.

"Through President Cabrera the whole situation has been changed and in my opinion the chances of any epidemic of yellow fever in the future are practically nothing."

Speaking of automobile possibilities, Mr. Smith said that the average citizen of Guatemala City is in better position to own an automobile than the citizen of New York, from the financial viewpoint.

Tomlinson Takes Over Invader Oil

The manufacture of Invader lubricants for automobiles, including cylinder oils, greases, etc., which has been in the hands of Charles F. Kellom & Company, Philadelphia, Pa., is now being taken over by the Invader Oil Company, 80 Broad street, New York. The company is incorporated with a capital of $250,000 under the laws of the state of New Jersey and its officers are as follows: Charles F. Kellom, president; T. E. Tomlinson, vice-president and general manager; H. Dunthorn, secretary and treasurer. Other men affiliated with the new company are: D. A. Scheu, A. A. Francesconi, Howard Plowman, Harvey Wilkins, E. Kalkhof, A. Rafelson and F. Menke.

T. E. Tomlinson, who is known as the original promoter and manufacturer of Havoline and Wolverine brands, and owns a controlling interest in the Invader concern, when interviewed by a represetative of THE AUTOMOBILE, stated that in addition to the Philadelphia factory, which will be continued, a new factory for the manufacture of automobile lubricants will be opened in New York City next week. The address of this factory will be 92 Pearl street, right in the heart of the oil trade district. The Invader company will manufacture products obtained from 100 per cent. Pennsylvania oil bases and nothing else.

Mr. Tomlinson was emphatic in stating that his interests in the Invader Oil Company are his only connections with this industry.

Electric Cranking and Lighting

Part III

Continuing the Electric Systems Now Used by Makers of Prominent Cars—The Widely Differing Practices of These Makers Should Be Noted—Methods of Regulation Important

Subject Digest

¶ What system best meets the requirements of electric cranking and lighting? A study of those adopted by different car manufacturers reveals a widely varying difference of opinion. The use of the electric cranking motor is in its infancy, so experience in this field is limited.

¶ The watt consumption per revolution should be a decided factor in the situation where a purchaser starts often and does not run at a high enough speed to recharge the battery.

¶ The means of regulation of the current vary among the makers. There are so many of these means each claiming a small group of supporters that no definite trend towards a given method can be noted.

¶ Devices for protecting the cranking motor after the engine starts are of interest. The use of the overrunning clutch is very prominent for this.

¶ Where a motor generator is used many of the makers drive the generator at one speed and have an entirely different reduction betwen the engine and the generator when the latter starts to operate. The means for this change of gearing also vary widely, planetary gearing, eccentric gearing, etc., are used for this.

FOR the past two weeks THE AUTOMOBILE has published a review of the electric problem as it is presented to the automobile manufacturer and buyer. In the following pages the review of the principle systems which have been adopted by various makers and which have actually been installed on their cars, is continued. It has been pointed out in these reviews that electric systems may be made in three separate and distinct systems. The three-unit, the two-unit and the single-unit. The three-unit system is that in which the cranking motor, the electric generator and the ignition current generator or magneto are in separate units. The two-unit system is that in which any two of these devices are combined into a single unit. The single-unit system is that in which all three of the units are combined into one. When an electric motor and generator are combined into one, the resulting instrument is a motor-generator.

It is of interest to note in what manner the systems vary. The voltages range between the limits of 6 and 30. The one, two and three unit systems are all in favor and are used by several of the makers. Many prefer flywheel installations where the motor-generator becomes the flywheel, the rotating members performing the functions of a balance wheel. The different methods of mounting are of interest because they vary widely.

There is a spirit of unrest among the makers and they have not accepted as standard the starting and lighting system as it now stands. It is to be predicted that the next 6 months will see a wide change in the mounting of the electric starter and also a gradual adoption of one voltage. The use of 6-volt lamps and ignition seems to favor this voltage, but there are others who believe that the requirements of the electric motor act against a voltage as low as this.

Rushmore—Uses Three Units

The Rushmore is a three-unit system. To the lighting equipment which has been on the market for some time, a cranking motor has been added. The entire system operates at 6 volts. In the Rushmore system the amount of current supplied to the lamps and storage battery is kept constant by the utilization of a peculiar property of iron wire, when included in an electrical circuit, of greatly increasing its resistance when heated. This is clearly shown in Fig. 6, in which the upper curve represents the performance of an iron wire resistance and the lower that of German silver or other material whose resistance does not vary with temperature. It will be seen that in the former the resistance is practically constant up to a certain point, allowing the current in amperes to be proportional to the pressure or voltage applied. At this critical point, however, which corresponds to a dull red heat in the wire, the resistance suddenly increases enormously as shown by the sharp upward trend of the curve. A very largely increased voltage is then required to force a single additional ampere through the wire. This form of resistance thus provides a simple means of maintaining a constant current so long as the voltage is not below that required to heat the wire to the "critical" point.

The Rushmore generator is of the ironclad bi-pole type, as shown in Fig. 3. The field ring is a plain cylindrical tube of electrically welded steel, inside which are bolted the two steel pole pieces. These pole pieces are simply sections cut from a steel bar cold drawn to exact shape and require no finishing. The field coils are of flat copper wire, wound in formers and afterwards bent so as to fit snugly the interior of the field ring. Each coil consists of two windings, the first being the field coil proper and the second, consisting of a number of turns wound on top of the first, forming an auxiliary coil, which operates in opposition to the main field coil. The armature is of the ordinary slotted type running on ball bearings fitted in the brass end castings, one of which also carries the two carbon brushes. Two lugs are provided when it is desired to bolt the machine to a flat surface, but these are removable so that a strap fastening may be employed such as is used in magneto fixture. This latter method

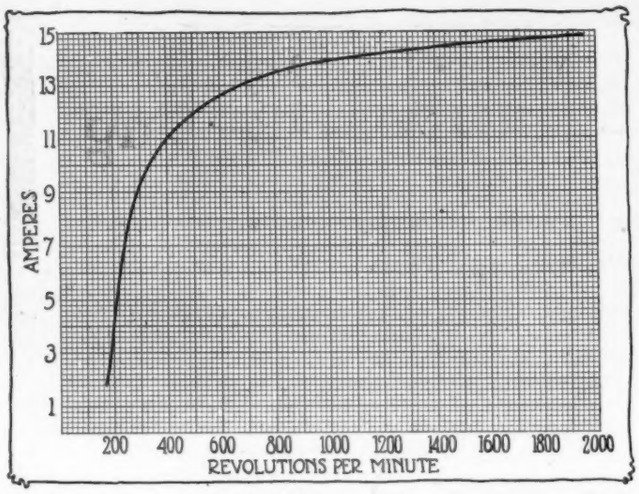


Fig. 1—Curve of output of Rushmore dynamo at various armature speeds

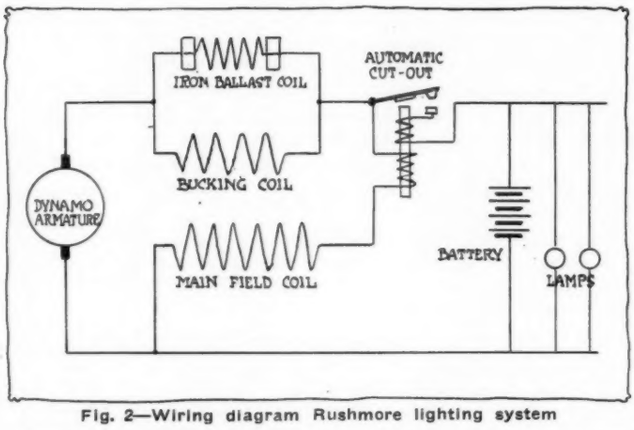


Fig. 2—Wiring diagram Rushmore lighting system

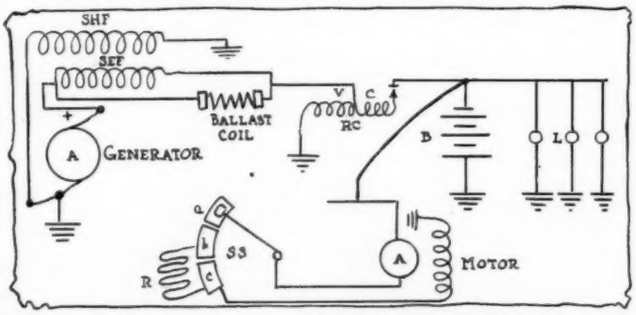


Fig. 3—Wiring diagram of Rushmore system with electric motor

requires a cradle type of bracket to fit the curvature of the magnet casing.

A small rectangular box fixed to the top of the casing contains an automatic cut-out, the purpose of which is to connect the generator to the battery when proper speed is reached, and disconnect it when the generator voltage falls below that of the battery. It consists of a double wound coil surrounding a short iron core, above which is pivoted a small iron armature. When this latter is attracted against the action of a spring, by means of current flowing in the coil, two switch contacts of silver are brought together completing the circuit from the generator to the battery. This cut-out, together with the iron resistance, mentioned above are the only regulating devices used. The latter is mounted on a small switchboard located on the dash and containing also the lighting switch and a fuse for the field coils. Owing to the heat generated in the iron wire and the necessity of allowing it to dissipate readily the wire is wound on a star-shaped insulator of a special asbestos compound, and surrounded

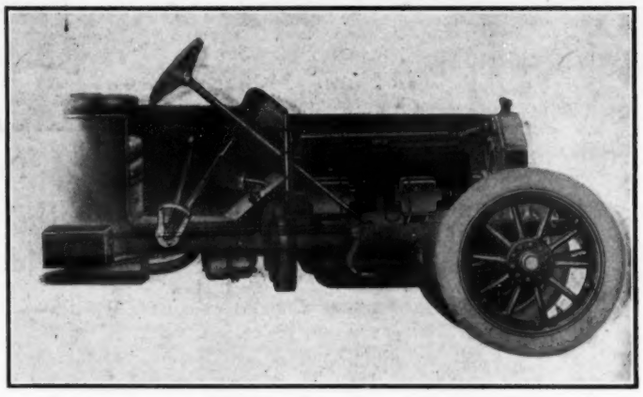


Fig. 4—Example of a Disco starting and lighting installation

by a ventilated cover permitting free circulation of air about the wire.

The technical term applied to this resistance is that of a "ballast coil." Its function may be seen by reference to the diagram of wiring Fig. 2. The ballast coil is shunted across the differentially wound coils on the field magnets. In other words, any current passing from the upper dynamo brush has two paths open, one through the ballast coil and the other through the secondary field winding. This latter is called a "bucking" coil. When the generator is running slowly the current flowing from the brushes is not sufficient to heat the ballast coil, which therefore provides an easy path, practically short-circuiting the bucking coils, and allowing the main field winding to fully magnetize the field magnets. The dynamo is now running as a simple shunt machine and its output increases with the speed, until sufficient current is generated to energize the fine winding of the automatic cut-out. This device is set to operate at a dynamo speed of 300 to 400 revolutions per minute, when the dynamo is furnishing current at about 7 1-2 volts. The current is now flowing through the series winding of the cut-out and thence to the battery and lights, furnishing the current necessary to light the lamps and also keep the battery fully charged. If the motor is raced the high voltage of the current generated raises the temperature of the iron ballast wire and so forces a quantity of current around the bucking coil, thereby reducing the magnetizing power of the main field, with a lowered output as a result. This output is practically constant. Its exact nature can be seen in the curve of Fig. 1, which has been taken from the Rushmore No. 2 generator.

When the car stops or is slowed down so that the generator is not supplying a sufficiently high voltage to overcome that of the charged battery the current from the latter passes in a reverse direction through the series coil of the automatic cut-out, releasing its armature and so disconnecting the generator from the main line. The lamps are then supplied from the battery alone.

The switchlock, intended for location on the dash, contains, besides the main switch, the iron resistance unit, a small fuse for protection of the field coils, and all the terminals necessary for wiring up to the lamps.

An incidental but important feature of this generator is its complete freedom from sparking at the brushes. This is of great practical importance, since a dynamo otherwise satisfactory, if it sparks, must have frequent attention to clean and occasionally sandpaper or true up the commutator, a job for which the average owner has neither the skill nor inclination. The exact reason for this absence of sparking is a little obscure, though the fact has been fully demonstrated. It appears to be connected with the location of the bucking coils which evidently have the effect of neutralizing the slight excitation which would otherwise arise in the coils short-circuited by the brushes.

Rushmore generators are supplied in two sizes, the smaller, No. 1, being 5.5 inches diameter by 8 inches long and weighing 23 pounds. Its capacity is 12 to 16 amperes at 6.5 volts. No. 2

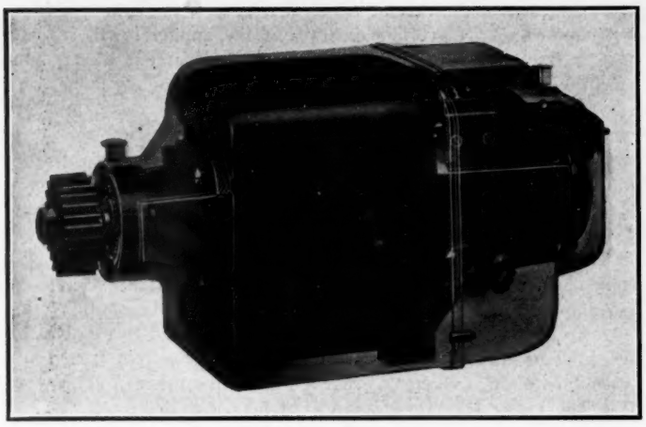


Fig. 5—View of Disco generator, showing armature and commutator

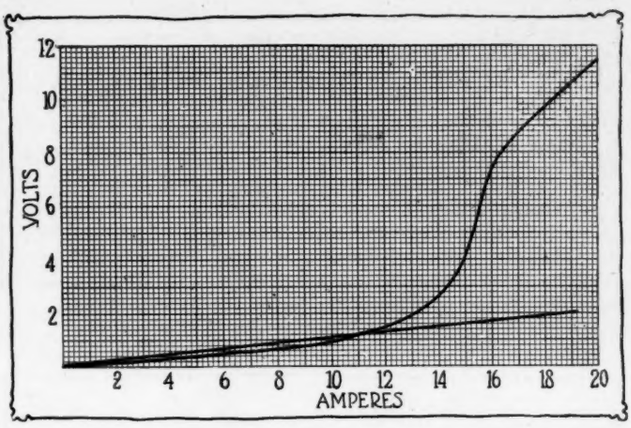


Fig. 6—Showing sharp rise of resistance of iron wire as compared to German silver

dynamo measures 6 inches diameter by 10 inches long and supplies 15 to 18 amperes at the same voltage.

The cranking motor operates directly on the flywheel without intermediate gears. A pinion keyed rigidly to the end of the armature shaft meshes with a gear on the rim of the flywheel. The pinion is normally out of engagement. The pinion is engaged when it is desired to crank the engine and becomes automatically disengaged when the engine picks up and runs under its own power. There is no mechanism in the cranking part of the system outside the simple series motor and the starting switch. The armature is held normally out of line with the pole pieces by a coil spring acting against the armature shaft. The second point on the starting switch causes the fields to become energized sufficiently to draw the armature into line against the pressure of the spring. The next point on the switch the motor starts to rotate slowly, making it mesh firmly with the flywheel. The fourth point on the switch allows the motor to rotate at full speed.

When the engine starts the counter electromotive force or the electric flow in the opposite direction to that passing through the motor, neutralizes the fields and the result is that the coil spring forces the pinion out of engagement with the gear on the flywheel and the cranking motor comes to rest.

To further describe the motor it may be stated that it is of the iron clad type with a steel shell 7 inches in diameter, and four drawn steel poles on which the field coils are slipped after being wound on forms. Several hundred meters will be drawn on the jump in this system, owing to the small voltage used. Large cables and absolutely tight connections are necessary in order to reduce voltage drop through these connections.

Disco—Three Separate Units

The Disco electric lighting, electric cranking and ignition system is in three units. It consists of separate electric generator, separate motor and an optional make of ignition, the mounting of which units in connection with an engine may be made to conform with the dictates of the engineers on whose design they are placed.

The Disco electric generator and cranking motor work at 12 volts and are the same size, the aluminum cases being interchangeable for either unit. The windings are, of course, different, the motor being series and the generator compound wound. These instruments are made in two sizes, known as models 3-E and 5-E, the latter being the smaller for smaller engines. The total weight of the generator and motor of model 3-E is 70 pounds, while 5-E weighs 50 pounds.

The system may be used in connection with any storage battery equipment desired, provided it is of sufficient capacity to do the work.

The electric generator begins to generate energy which it sends to the storage battery when the speed of the engine has reached a speed corresponding to about 7 miles an hour of the car

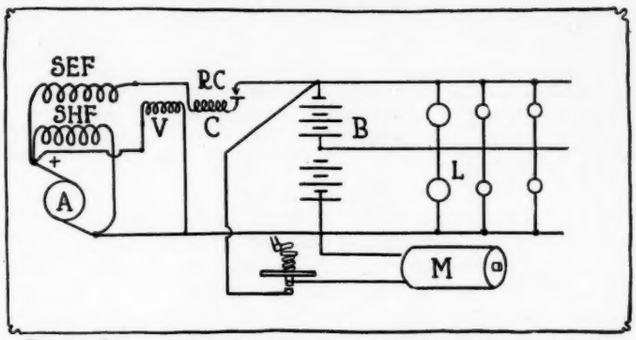


Fig. 7—Disco wiring diagram, showing series and shunt fields

when running on direct. Below this speed of the engine the automatic cut-out switch does not operate to make connection between storage battery and generator, thus preventing the storage battery from discharging back through the generator when the engine is running idle or at very low speed. At car speeds above 25 miles an hour the generator is again automatically cut out, the charging curve being therefore between the limits of 7 and 25 miles. It reaches its highest point at about 15 miles an hour. This charging range may be varied, however. Below 7 miles an hour, and when engine is not running, lighting current comes from the storage battery.

The electric motor may be so placed as to drive through the flywheel by means of teeth cut in the periphery of the latter with which the teeth of a pinion mounted on the motor armature shaft mesh. Or the motor may be so mounted to drive through the timing gears or special gears at the front end of the engine. The preferred mounting, however, is the placing of the electric motor and generator on opposite sides of the engine and at the forward end so that they are driven, or drive, as the case may be, through some sort of connection with the front gears.

When mounted in connection with the timing gears, the Disco electric motor drives through a roller clutch which cuts out as soon as the engine starts. When the driver makes electrical connection between the electric motor and the storage battery through a switch it causes the cranking motor to operate, revolving the crankshaft until the engine takes up its own cycle. As soon as this happens a roller clutch automatically breaks the driving connection between the electrical unit and the engine, and providing the operator has released the switch, the electric cranking apparatus comes to rest.

The amperage required for starting depends upon the installation, upon the stiffness of the engine and upon the compression pressure. It is therefore difficult to give any definite figure for this. It has been found, however, that 60 amperes are required to turn over a Haynes 4 1-2 by 5 1-2-inch engine at 120 revolutions per minute. Another engine of larger dimensions—4 7-8 by 6 inches—drew 90 amperes for starting. These pressures are

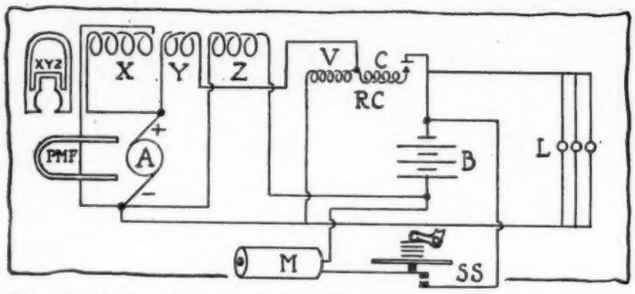


Fig. 8—Wiring diagram of the Esterline cranking and lighting system

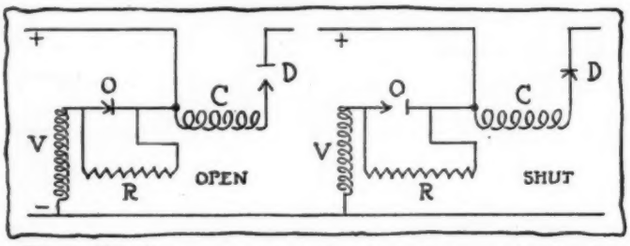


Fig. 9—Esterline reverse current cutout diagram, showing how the current is automatically interrupted when flowing in a reverse direction

only momentary, however, lowering immediately the moving parts of the engine are got under way. No compression release is used in connection with the cranking apparatus, it being so designed for each installation that it will work against full compression. The lamps are wired on the three-wire system and operate at 6 volts.

The reduction ratio between electric motor and engine depends upon the installation, but in the average case about twenty to one would be used. With this gearing an average four-cylinder motor should be cranked at about 150 revolutions per minute, while in the most extreme case the electric motor would turn the crankshaft at about 114 revolutions per minute.

If specially desired, the Disco system may be made to combine ignition along with its other electrical functions. In this case the electric ignition current comes direct from the storage battery. A coil is used, it being a low-tension arrangement. The ignition part, it will be seen, has only the storage battery in common with the rest of the apparatus.

Esterline—Made in Three Sizes

The Esterline is a three-unit system, having the generator, electric motor and magneto as entirely separate units. The electric motor is geared to the flywheel in the typical layout by means of a pinion on a roller clutch. When the speed of the gasoline engine equals or exceeds 100 revolutions per minute the roller clutch comes into action and the electric motor is disconnected from the engine. The generator is preferably driven by gearing or silent chains and is made in three sizes, differing only in the speed in which they operate. The largest machine operates at 1.5 crankshaft speed, the next size at double the crankshaft speed and the next size at 2.5 crankshaft speed. The entire system operates at 6 volts using a three-cell storage battery.

A simple series-wound motor is used. With this type of winding the turning moment, or torque, of the electric motor increases with the load, this being a condition which is rendered necessary by the function of cranking the engine.

The generators made by the Esterline company are built under the Berdon patents. The electro-magnetic field, which is combined with the permanent magnet field, has a shunt and differential windings, X, Y, Z.

The amount of current drawn by the starting motor in turning over an engine will depend altogether upon the size of that engine, the amount of compression, the temperature of the atmosphere and the rate at which it is revolved. Taking a four-cylinder motor of average dimensions the ammeter will register 160 initial starting current with a running current of 115 amperes. On a six-cylinder engine having a bore of 4.5 inches and a stroke of 7 inches the initial starting current was about 250 amperes and the running current 140. A compression release is not necessary with any starter. Two gear ratios between the motor and the engine flywheel can be furnished. One is sixteen to one and the other thirty-two to one, both being with herring-bone gears for silence.

The storage battery usually furnished by the Esterline system has a capacity of 120 ampere-hours at a discharge rate of 10 amperes. The length of time a motor may be spun by this battery depends, of course, on the power required to revolve the engine and the temperature conditions. On a medium-sized four-cylinder motor at about 65 degrees Fahrenheit the gasoline engine can be spun 45 minutes to an hour and a half. On the large six-cylinder motors the time is reduced to 30 or 45 minutes. The operation of the starter consists of pressing a foot button on the dash, which shifts the starting gears and closes the starting switch. The switch is of the laminated copper type, having a large conducting area.

Remy—Makes Any Type Desired

Remy makes any desired type. In the main the line consists of three interchangeable systems, a three-unit, two-unit and single-unit being produced. All these systems work at 6 volts and are interchangeable in that respect. The method used in mounting the various units in the Remy system is left to a large extent to the automobile manufacturer, and a special installation is used to suit each particular case. The generator is shunt wound and has the third brush regulation, which is common in lighting work. The generator is made in two styles, one including the combination timer and distributer for ignition purposes; the other without. Where magneto ignition is not desired the first type can be used, while with the magneto the ignition attachment will not be necessary. The generator starts to charge the battery at an armature speed of 200 revolutions per minute. Between 200 and 1,100 revolutions per minute where a maximum amperage is attained the charging rate is almost constant. Above this point the charging rate drops off. With the third brush regulation, in which advantage is taken of the distortion of the magnetic field at high speeds, the voltage is kept practically constant throughout the operating range. A reverse current cut-out prevents the battery from discharging through the generator when the car is at rest.

The cranking motor is simple series wound, whether it is single unit or incorporated in the two armature motor-generator. The installation of the cranking motor depends entirely on the engine to which it is supposed to be attached, but as a rule the motion is transmitted through reduction gearing in connection with a roller clutch. The cranking motor is meshed with the gearing when the starting switch is first thrown in, and then, upon the full application of the switch, cranks the motor. Battery used with this system is optional with the manufacturer, who may go as far as he likes in the matter of weight. One feature of protection which is unique on this system is the fuse, which takes care of the generator. Should the wires from the battery be severed the excess voltage would not burn out any part of the circuit except the fuse.

Auto-Lite—A 6-Volt System

The Auto-Lite is a three-unit system, the cranking motor, generator and magneto each being a separate and distinct unit. The system works at 6 volts, the motor, generator and magneto each operating at a current of this potential.

In the average installation the generator is driven from the crankshaft by a silent chain; the gear reduction between the generator and the crankshaft of the engine is two and one-half to one. The principal dimensions of the generator are as follows:

Generator base height	2.125	inches
Generator width	4.5	inches
Generator length	10.5	inches

The output is regulated by means of a slipping clutch and centrifugal governor. In this clutch the operation is entirely automatic. The weights fly apart and in doing so decrease the pressure between the frictional surfaces and allow one to slip over the other, thus decreasing the speed of the drive. This arrangement prevents the output of the generator from rising to a point where it would harm the storage battery.

In order that the battery cannot discharge back through the generator when the car is standing idle, a reverse current cut-out is used. This is of the magnetic type and is controlled by a voltage coil only. When the voltage of the generator falls below that of the storage battery the circuit is automatically broken by a spring which pulls the relay armature away from the magnet as the current becomes weaker, thus breaking the line between battery and generator. The operation of this type of reverse current output was explained in last week's issue and in this connection the hydraulic parallel drawn between the entire system and the lighting and starting system should be studied. The reverse current cut-out was compared to a ball check. In the Auto-Lite system it is housed between the magnets of the generator.

The cranking motor weighs 33 pounds. It is series wound and runs at from twenty-five to thirty-five times the crankshaft speed. The reduction gearing may be by spur gears, silent chain or worm or a combination of two or more. A roller clutch is used to disconnect the starter and its train of gears when it is not in use. After the engine has been cranked the control switch is thrown off and allows the electric cranking motor to come to rest until again needed.

Generally a 6-volt, 120-ampere-hour storage battery is used with this system. On two installations, an Abbott and a Jackson, where the motors were 5.5 and 5.25 inches respectively in stroke and 4.5 inches bore each, the starting motor turned the Abbott at a rate of 80 revolutions per minute and the Jackson at 88 revolutions per minute at gear reductions of thirty-five to one and thirty-three to one respectively.

Entz—Employs Motor-Generator

The Entz cranking and lighting system employs a motor-generator and is hence in the two-unit class. The motor-generator is mounted on the side of the gasoline motor and in one of the most prominent installations of this system is connected directly to the crankshaft of the motor by a silent-chain drive. The motor-generator is constantly rotating. The winding on the armature is such that at car speeds below 10 miles per hour on high gear it acts as a motor and is helping to propel the vehicle. Above this speed it acts as a generator and charges the storage battery, which is so designed that it cannot be injured by an overcharge, the decomposition of the electrolyte being the only result of a long-continued overcharge. The system operates at 18 volts and takes care of the lights as well as the starting apparatus in the customary way. The reduction between the electric starting motor and the gasoline engine is, in the customary installations, 3 to 1 on a 4 by 4-inch six-cylinder motor, and 2.6 to 1 on smaller motors. No compression release is used on this starter. In the early day of the electric starter this was more or less of a necessity with many of the systems, but it may be stated that through the gamut of starters now on the market which rely on electricity for their motive power there are none which require a compression release. To operate the starter a knife switch with a large handle located on the dash is pushed down. This connects the battery to the motor-generator which at this time acts in the capacity of an electric motor and turns over the gasoline engine at a speed of about 80 revolutions per minute. This is sufficient speed to allow the motor to be started on the magneto. The switch is then left down. When the speed of the gasoline motor becomes higher than necessary to drive the car at the rate of 10 miles an hour on high speed the motor-generator begins to fill the office of a generator and supplies current to restore that drawn from the storage battery for the purpose of starting the gasoline motor or for restoring the current used by the lights when the car is standing idle or when running slowly. In mid-position the generator is disconnected.

Deaco—Adds Motor to Lighting System

The three-unit system which has been added to the Deaco line of automobile electrical apparatus is incorporated with the lighting system in so far as the storage battery, which is charged by a lighting generator, furnishes current to an electric motor when the latter is used for cranking the automobile engine. The combination system of starting and car lighting consists essentially of a motor, a generator, an automatic cut-out switch, a control switch, storage battery and lamps. The starting system proper takes in the storage battery, control switch and electric motor.

The electric motor is connected to the engine in one of two ways, one being through silent-chain connection with the crankshaft at the front of the motor and the other through gearing meshing with teeth cut in the flywheel face. In the first case the chain sprocket mounted on the crankshaft contains a floating clutch which automatically releases the driving connection between the electric motor and the crankshaft when the engine begins to run under its own power, allowing the starting apparatus to come to rest.

To operate the cranking system, the driver simply makes the electrical connection between the storage battery and the electric motor by closing the control switch. This sets the motor in operation, turning the crankshaft through the silent-chain connection. The floating clutch takes care of the apparatus once the engine starts. Then the control switch is thrown off, allowing the starting motor to come to rest.

In the application of the starting motor to the flywheel, a roller clutch is used, the gear of which engages with the flywheel teeth on the pressure of a pedal on the floor board of the car. After connecting the gearing, the electrical connection is made the same as in the other method of mounting, the working of the device being the same.

The motor is geared 18 to 1 to the engine in the silent-chain

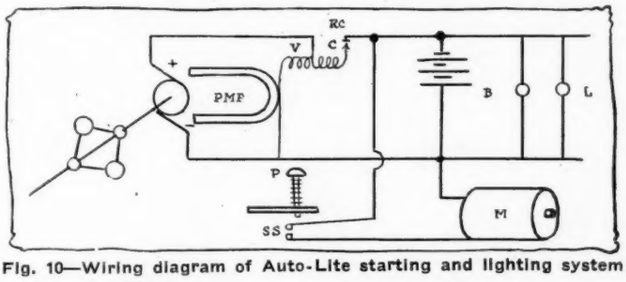


Fig. 10—Wiring diagram of Auto-Lite starting and lighting system

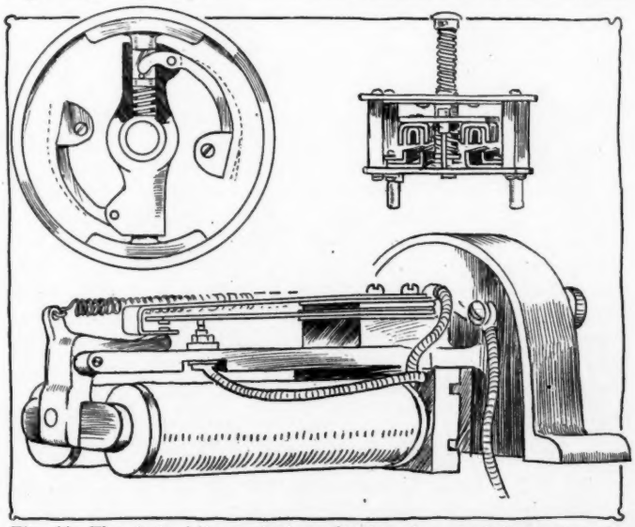


Fig. 11—The Auto-Lite control mechanism for regulating generator output

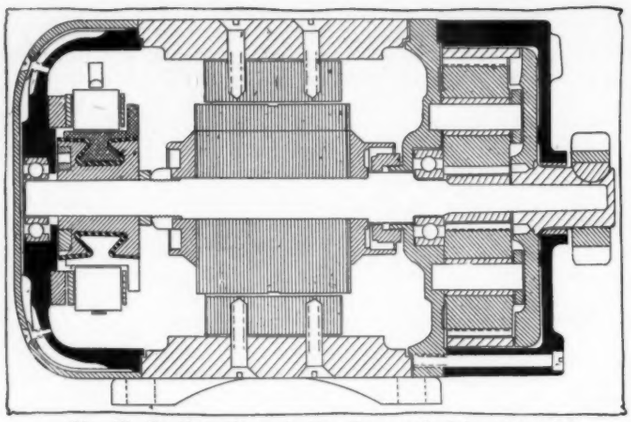


Fig 12—Section through the Deaco electric generator

arrangement, and will usually crank the engine when running at 1,500 revolutions per minute, which means an engine speed of about 85 revolutions per minute. The electric motor measures 10 inches in length by 6.75 inches in diameter.

The weight of the starting apparatus exclusive of battery is 60 pounds. The battery used is a Willard 6-volt and 120 ampere-hour type. It weighs about 69 pounds.

The starting motor draws from 150 to 200 amperes at 6 volts in starting an engine. This amperage is only momentary, for when the engine begins to get under way the high initial torque required to start the moving parts, due to their inertia, is overcome, and only 100 amperes are drawn to revolve the crankshaft until the engine picks up its own operation.

No compression release is necessary with the system. The motor and generator being mounted on opposite sides of the engine, they balance. A section through the center of the Deaco generator is given in Fig. 12. Note armature shaft mounting.

The automatic cut-out is installed in the circuit between the generator and the battery. It acts as a circuit-breaker to prevent the current which has been stored in the battery from discharging back through the generator when the engine is standing still. When the latter is started and the generator voltage is slightly greater than that of the battery, the cut-out established connection, allowing current to flow from the generator to the battery. But when the generator slows down so that its voltage drops below that of the battery, the circuit is automatically broken.

When the motor is not running so as to cause the generator to furnish current for the lights, the energy comes from the storage battery. But at high speeds the generator supplies the lights direct. At intermediate speeds when the current generated is not alone sufficient for the lights, the generator is assisted by the battery. This is all automatically regulated by the cut-out switch.

Adlake—A Three-Unit Type

The Adlake electric cranking and lighting system is made by the Adams & Westlake Company. It may be classed as one of the three-unit type as it consists of a generator and an independent motor. The ignition system is optional with the user.

The system is designed to operate at 6 volts both in starting and lighting. It has a new generator which is a simple, shunt-wound machine of large capacity with a two-pole laminated iron field. The older machine did not possess a laminated field. The latest machine carries its load at a slightly lower speed and yet weighs only 38 pounds instead of 48, as formerly. The generator is driven at engine speed and has capacity sufficient to carry the lighting load at about 325 revolutions per minute.

The system consists of a 6-volt generator, a three-cell, 6-volt storage battery, a field regulator and a series motor. The field regulator, the circuit breaker and the action of the headlight switch are the features of the system.

Regulation is obtained by varying the amount of resistance in the shunt-field circuit. As the current output increases resistance is added in the field circuit thereby cutting down the current therein and reducing the output of the machine. This is effected by the controller, Fig. 14. This consists of a wheel over which passes a flexible cable. To one end of the cable is attached a weight W to the other end a soft-iron cylinder S. To the wheel is fixed an arm with a brush V moving over the resistance contacts. When V is moved in a clockwise direction it adds resistance, thus cutting down the output of the generator. It is caused to move in this direction by the action of the electric current passing through the two coils a and b, which pull the soft-iron cylinder S downward. As the coils a and b are in series with the line they exert a pull which is always proportional to the output of the generator.

It will be noted that there are two coils. When the headlights are not burning both coils pull on the regulator and hold the output to 6 amperes, for example. When the headlights are turned on one of the coils is cut out. As the coils are the same size, this cutting out of one coil reduces the pulling power to one-half and as a result the generator practically delivers twice as many amperes as before or 12 as compared with that above.

What this variation in output means may be summed up as follows:

Output, Amperes	Lights	Charging rate, Amperes	
6	All out	6	Day running condition
6	Side and tail	1½	City running at night
12	All lamps	1½	Country running
12	Side and tail	7½	Winter work

The object as outlined in the first three conditions is to maintain a fairly low rate of charge when no lights are burning, as during the day. The second object is to maintain the same charging rate when the headlights are burning as when the side lights are lit. The last condition is that of driving in winter when the user of the car does little touring. He will therefore scarcely balance the demand for electricity caused by the longer hours of darkness which comes with the long winter evenings.

The circuit breaker in this system takes the place of the reverse current cut-out. It consists of two pairs of coils, one pair, the voltage coils, being permanently fixed, while the current coils are mounted upon an armature which closes the current switch. Their action is identical with that of any reverse current cut-out. The voltage coil first causes the closing of the relay. As soon as the current starts to flow through this relay from the generator to the battery the series coils of the relay are excited and help to keep the relay closed. On the other hand, as soon as the battery current starts to flow back through the relay to the generator, which happens when the motor is stopped, the series and voltage coils are repelled, thus opening the circuit and preventing the battery from discharging through the generator.

The Adlake starter consists of a cranking motor and suitable gearing to connect it with the flywheel. The reduction from motor to crankshaft is twenty to one. The starting motor weighs about 40 pounds and may be located wherever the automobile manufacturer desires to put it. It takes about 80 to 120 amperes when cranking a motor, this rate depending on the size of the motor to be cranked. Its application to some standard motors will be shown in a subsequent issue.

Elyria-Dean—Slow-Speed Generator

The Elyria-Dean system is of the three-unit type. The motor is arranged to be geared to the flywheel or some other suitable part of the gasoline engine, while the dynamo is operated at magneto speed and can be mounted in such a way that the magneto driving shaft can actuate it. The dynamo may, if desired, be made to take the place of the magneto by mounting a combination timer distributer on the end of the armature shaft, thus giving a two-unit system. The motor is only in operation when used for starting a gasoline engine. No gears or other portions of the starting equipment are in motion normally. The act of throwing the gears into mesh closes the battery switch so that the electric motor cranks the engine and as soon as the

latter takes up its regular functions an overrunning clutch within the gearing disconnects the two elements. The releasing of the starting lever allows the gears and switch to return to normal. The dynamo is arranged to charge the storage battery at an armature speed of between 190 and 250 revolutions per minute, depending on whether a starter is applied or not. The system works at 6 volts, using a standard three-cell, 6-volt starting battery. Both the dynamo and the motor are wound for this voltage. The electric motor winding is of the simple-series type, while the dynamo has a differential compound winding. A differential coil regulates the charging rate at high speed.

The amount of current drawn for starting will depend entirely on the nature of the gasoline engine and the effort necessary to turn it over due to surrounding conditions. Under average conditions, however, with a motor of about 30 horsepower, the running amperage will be in the neighborhood of 80 when turning the motor over at 80 revolutions per minute. A compression release is not necessary for this type of starter. A battery of 120 ampere-hours capacity, figured on a discharge rate of 10 amperes, is recommended for the Elyria-Dean system. The gear ratio between the Elyria-Dean cranking motor and the gasoline motor is arranged to suit the power plant and varies between twenty to one and forty to one. On an average it may be stated that effective cranking speed can be maintained for over 20 minutes.

Characteristic Generator Curves

In general there are four types of generator characteristic curves, examples of which are shown here, Figs. 15 to 18. The first, that of the Ward Leonard generator; second, one which might be obtained either from the Westinghouse or the Esterline apparatus; third, that obtained from the Gray & Davis dynamo, and last, that which is produced by the Adlake system.

The first one has a very flat maximum out-put line due to the external regulation which prevents the amperes developed by the machine from exceeding this value. On the Ward Leonard machine this is accomplished by a relay outside of the generator which cuts resistance in and out of the field circuit.

The second sample is characteristic of all machines that have inherent or electrical regulation. Such machines always have a curve which rounds up nicely and does not have a knee as in the first curve shown. Having two out-puts, one with and the other without the lamps, is due to the special method of connecting up the windings on both the Esterline and Westinghouse systems.

Gray & Davis is so connected in the shunt field circuit that whenever the lights are turned on the output of the generator increases in proportion. Notice how the supply of current increases as the lights are turned on.

The same characteristics are found on the Adlake machine, a curve of which is here shown. The regulation here is accomplished by changing the connections when turning on the head lights, not by electricity, as in the case of the Westinghouse, Esterline and Gray & Davis systems.

The four types of generators which are here characterized by their output curves represent the different methods of regulation, namely, electromagnetic, Ward Leonard machine; inherent on the Esterline and Westinghouse machines; a centrifugal governor on the Gray & Davis machine and variable resistance on the Adlake.

(To be continued)

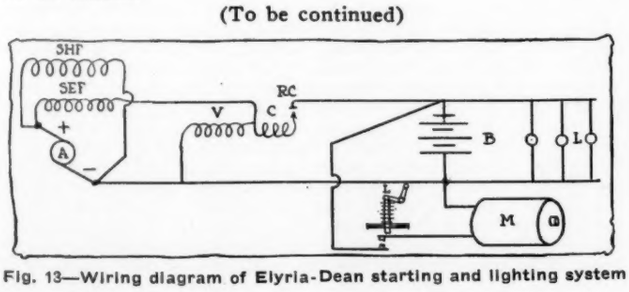


Fig. 13—Wiring diagram of Elyria-Dean starting and lighting system

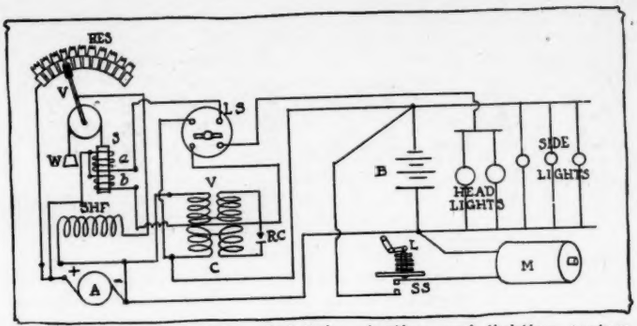


Fig. 14—Wiring diagram of Adlake starting and lighting system

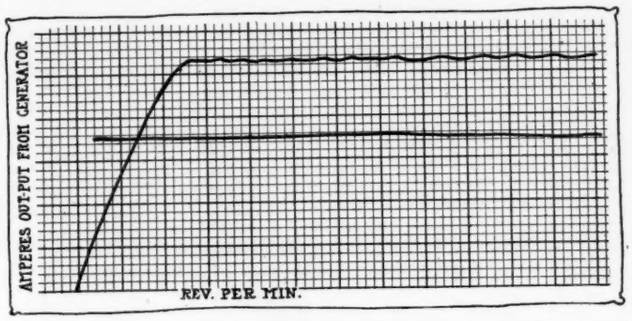


Fig. 15—Ward Leonard generator output curve. Note straight line maximum output characteristic

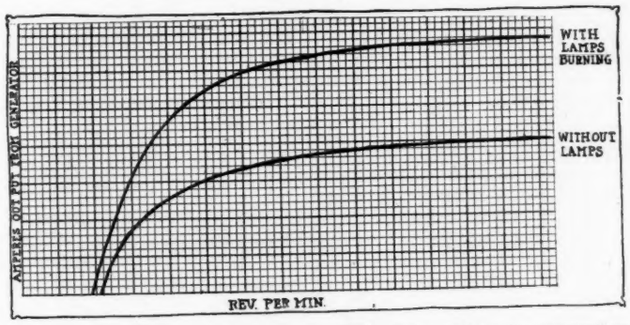


Fig. 16—Esterline output curves. Output increases in proportion to lamp load which is shown by the two curves

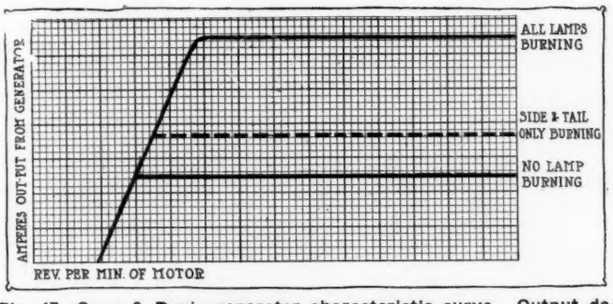


Fig. 17—Gray & Davis generator characteristic curve. Output depending on number of lamps burning

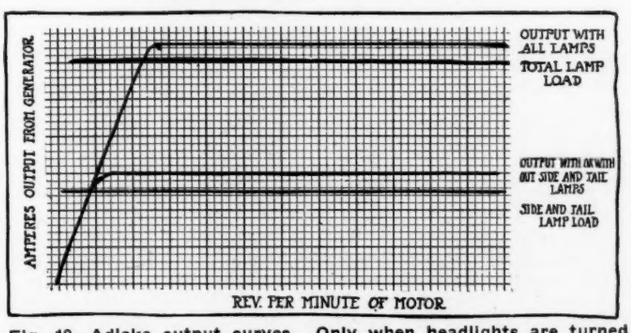


Fig. 18—Adlake output curves. Only when headlights are turned on output is increased

S. A. E. Papers Illustrate Progress

SIZING up the situation at the Winter Meeting of the Society of Automobile Engineers, the assembled members listened to the committee reports reproduced in last week's THE AUTOMOBILE, after which a number of special papers were submitted to them. During the commercial session of Thursday C. T. Myers, N. B. Pope, L. C. Freeman and B. B. Bachman read pertinent papers, followed by discussion, a gist of which appears below. Worm gears, truck motor starters and metal wheels were also discussed, although they were beyond the scope of the four papers. On Friday automobile motors and running gears were discussed after the reading of papers treating of various subjects. On Saturday the engineers heard papers on magneto couplings, the probable future of electric starting and lighting, the magneto and the six-cylinder motor.

ON Thursday, January 16, four articles dealing with freight automobiles, their design, equipment, handling and kindred phases of the subject were read. The first of these papers, dealing with truck performance, is reproduced below.

Comparative Data on Performance of Motor Trucks with Regard to Size of Motor and Gear Ratios

By Cornelius C. Myers

TWO years ago I was called upon to make a report of the gasoline motor trucks which were exhibited at the New York Show, for three concerns about to purchase nine trucks, varying in capacity from 2 to 5 tons. I was impressed by what I considered the large size of the motors installed to drive most of the trucks, and I tried to find out from several makers the points which governed their designers in the selection of the particular size and type of motor. I got almost no satisfaction, and was inclined to think that in some cases the size was an approximation somewhat on the order of the old rolling mill formula of "calculate it big enough and then multiply it by two."

Having done some little estimating myself on this point, I got together as much as I could of the data necessary for making a comparison of the rated motive power furnished with the various trucks, in relation to the duty to be performed. I compared these figures to see whether there was any uniformity, but found little to show that any particular rule had been followed. In scanning the details of the various trucks, however, I was not so surprised at this, for there was also evident in other features of design a considerable divergence from the ideal before the designer.

I think I can say without fear of contradiction **that all machine design is a compromise.** If you will admit this I think you will agree with me when I say that the design of our beloved motor truck is a compound of compromises. Large wheels mean easy riding, less power and more road clearance; but an increase in unsprung weight, higher body platforms and greater first cost. Large sprockets mean lighter chain tension and less wear, but greater cost, less road clearance and in some cases lower efficiency. Inswept fronts of frames allow a shorter turning radius, but mean increased axle stresses and less room under the hood or floor-boards. Large motors afford power to overcome abnormally bad road conditions at high speed, but entail heavier construction and more dead weight, more expensive transmission systems, greater fuel consumption and tire expense, higher maintenance expense or depreciation charges, and greater manufacturing cost.

But in some cases it is hard to get absolute and authoritative data—and the motor truck design faces many such. In the absence of some of these facts we must proceed with caution toward a well-chosen ideal; certain standards must be assumed and experiments then carried on to check these standards and collect positive data.

Five Resistances to Overcome

I find but meager data on which to base the selection of motor sizes for trucks. This is the more regretable, in my opinion, because I believe that this point will have a very considerable bearing on the development and general expansion of the motor truck industry. At our meeting last summer Mr. Batzell presented a paper covering gasoline motor characteristics in a very thorough manner, and he advocated the adoption of motors much smaller than the average practice in motor trucks to-day. I will outline some of the conditions which must be considered in making the selection, and give the results of some work I have done along this line.

In order to operate a motor truck, its motor must be large enough to overcome a total resistance composed of five items.

(1) **The resistance due to the friction** in the component parts of the transmission system.

In chain-driven trucks this is generally based on an average efficiency of 70 per cent. This, I think, can be bettered now that the owners and drivers more fully appreciate the large returns to be netted by a little careful and regular attention to working parts, and now that designers understand the essential requirements of the transmission system in the way of proportion and suspension—the best compromise for those parts.

(2) **Wind resistance.** This is almost negligible except in the cases of high-speed delivery wagons and fire apparatus.

(3) **Acceleration.** This is generally covered if the motor can easily overcome the other items, and provided the gearbox is properly designed.

(4) **Grade resistance.** It goes almost without saying that the truck should be able to ascend light grades without shifting gears, unless the road resistance in Item five is unusually high. The truck, fully loaded, should be able to take grades up to 3 per cent. in high gear on good pavement.

Finding the Road Resistance

(5) **Road resistance.** This is the most important and complex item of the five. It will depend upon the total weight of the loaded machine, the character of the road surface, the diameter and width and compound of the tires, and the diameter and type of the wheel bearings.

In making comparisons with regard to motor size, I have used a formula which is a relative one, covering four-cylinder four-cycle motors, developing rated S. A. E. horsepower. This gives the tractive effort in ton of total weight on the tires for a transmission efficiency of 70 per cent.

$$E = \frac{23.52 \times d^2 \times s \times R}{D \times T}$$

E Tractive effort in lbs. d Cylinder bore.
T Total weight in tons. s Cylinder stroke.
D Diameter of driving tires. R Gear reduction.

In the present state of the art of motor construction, I do not think it is unreasonable to expect a motor to develop 20 per cent. more torque at normal operating speeds than the equivalent of the S. A. E. rating. This may be questioned by some, but I know that better results are being obtained from several different makes of motors, and I see no reason why so important a machine as a motor truck should be burdened with an inefficient motor. On the contrary, I think it is very important that **only the most efficient and carefully designed motors should be considered fit for such service.** The constant in the formula then becomes 28.22, and if the result is divided by 2,000 we shall have the "tractive factor" of any particular truck and motor as a percentage of the total load on the tires. This "tractive factor" will denote the relative ability of a truck and its power plant to any other—provided, of course, that the motor is given an equal amount of power per cubic inch of cylinder displacement, and the transmission systems are equally efficient.

The following tractive factors are averages covering trucks of well-known manufacture as exhibited at the New York Show in 1911. They show what designers (or perhaps in

some instances the sales department) considered good practice in 1910—the state of the art in that year:

1-ton	0.0864	3-ton	0.0700
2-ton	0.0730	5-ton	0.0616

Now let us figure, as well as we are able, the resistance to be overcome by a truck under average conditions. This resistance factor should be the measure of the power of the motor and equal to the tractive factor. In most of my calculations I have used the figures given by Mr. Churchward on page 9 of the S. A. E. Hand-book. Let us assume that with good tires the road resistance on hard, level asphalt is 20 tons, using this as a basis in the table that follows. If we divide this by 2,000 the resistance factor is .01 on this kind of road surface. Similarly, for the other six kinds of road surface there given we have:

Wood pavement	0.0115	Good dirt road	0.0110-0.0200
Level macadam	0.115 -0.0300	Ordinary country road (dirt)	0.0200
Plank road	0.009	Sand	0.200
Cobble stones	0.0175		

The French War Office has given much attention to the motor truck; in fact, the subsidies granted by the French Government through its War Office have had a very stimulating effect in increasing the average efficiency of the trucks made in that country and in promoting the sale of these trucks. Capitaine Renaud, the motor truck expert of the French War Office, gives the resistance factors as follows: City pavements—0.013-0.017, country roads—0.016-0.041. He uses a "tractive factor" = 0.041. Items (2), (4) and (5).

Grade resistance is readily reduced to an equivalent resistance factor by dividing the percentage by 100. Thus on a 3 per cent. grade it is 0.030.

I think the average resistance of a macadam road can be taken at 35 tons = a resistance factor of 0.0175, which, added to the grade, gives a total resistance factor of 0.0475. This is the measure of the power required of the motor when working under the conditions given above, and to which the "tractive factor" should be equal.

Referring now to the actual tractive factors of the 1911 show trucks. Under average level road conditions these motors would be operating at the following percentages of their S. A. E. load ratings: 21, 24, 24.8, 28.4. As against these figures the motor having a tractive factor of 0.0475 would be operating at 36.6 per cent. of full load; or, **the 1911 motors were respectively 75, 52, 48 and 28 per cent. larger than necessary.** If the greater part of the routes of a large majority of these trucks is over pavements having a lower resistance factor than 0.0175, the over-abundance of power is magnified, and by plotting these figures against the fuel consumption curve of the motor, the possible increase in gasoline mileage will be found to be very marked. Inasmuch as fuel now costs about 50 per cent. more than it did 2 years ago, and there are prospects of a further advance, this subject of fuel consumption must be seriously considered.

Motor Capacity Exceeds Load

Coming now to the trucks exhibited and offered for sale in 1912, the figures given below show some improvement, but it is not a very marked one.

Size	Percentage of aver. load on motor	Excess motor capacity	"Tractive factor"
1-ton	22.1	66.0	0.0788
2-ton	26.3	39.0	0.0664
3-ton	28.8	27.0	0.0607
5-ton	28.9	26.5	0.0605

The averages were bettered to a large extent by the newcomers to the show; most of the manufacturers who exhibited the year before changed but little in their design in the respect we are considering.

While I do not claim that conditions in this country are the same as those in France, I think it will do no harm to set down here by way of comparison the "tractive factors" which French engineers have considered the best suited for economical truck operation. I give below comparative figures which to me are very interesting in the light of the results obtained in the matters of mileage per gallon of fuel and total tire mileage. These figures are averages of all but a few of the trucks which competed in the 1912 Trials conducted by the French War Office, and most of the trucks bear the names of firms celebrated throughout the world as masters in automobile construction:

Size	Percentage of aver. load on motor	Excess motor capacity	"Tractive factor"
2.5-ton	45.0	—19.0	0.390
3.5-ton	47.0	—22.0	0.0373
5.5-ton	48.0	—24.0	0.0356

These trucks will cover 11.7, 9.6 and 7.0 miles per gallon—performances certainly much better than those of our own trucks. It can hardly be claimed that these trucks lack power, either, for practically the same list of trucks entered the Russian War Office Trials, a short time after the French Trials, and all were accepted as eligible for army service in Russia, the Russian Government placing orders with every French firm which had a truck entered. From all reports, the trials were as gruelling as any which a motor truck ever entered.

As between the average "tractive factors" of the trucks in this country and those abroad, the figure I have given happens to stand about half way, although it was not arrived at by means of averages. Having assumed certain things as my standards, I made some experiments to check them, in accordance with the mode of procedure I mentioned early in this paper. These experiments confirmed, in a rather rough way, it is true, that my assumed tractive factor was on the safe side. The experiments were not confined to any one make of truck, or any one truck of a particular make. In some trucks substitutions of various parts were made for direct comparison. The trucks had all been in service from 1 to 4 years; all were of one type—double chains driven from a jackshaft—and in most cases they were handled by the owners' drivers. As examples I shall give the results of two tests.

Motors Too Large on Average

(1) A truck carrying 3,000 pounds, driven by a 3 by 4.5 four-cylinder motor, tractive factor 0.040. This truck repeatedly mounted a 2 3-4 per cent. grade over old, rough water-soaked, wood-block pavement, and mounted a 3 1-4 per cent. grade over a fair macadam pavement. The resistance factors overcome I estimated at not less than 0.0525 and 0.0300.

(2) A truck carrying 5.5 tons, driven by a 4.5 by 4.5 four-cylinder motor, tractive factor 0.0286. This truck mounted a 3 per cent. grade over a good brick pavement. Resistance factor estimated at 0.0400. With a greater gear reduction, gained by a change of jackshaft sprockets, so as to give a tractive factor of 0.0336, this truck mounted a 3.25 per cent. grade over a somewhat worn brick pavement. Resistance factor estimated at 0.0475.

Here are discrepancies due to the lack of positive data covering essential points in the problem. Either the efficiency of the transmission systems considerably exceeded 70 per cent. or the motors developed unusually heavy torques, or the road resistances were less than indicated. All my experiments, however, indicated that **motors of smaller average size than those now in use can be made to handle our trucks in a practical and economical manner, provided certain features are well carried out in design and construction.**

At our meeting last summer, Mr. David Fergusson, in discussing this subject, very rightly remarked in effect that the size of the motor must be chosen as the result of experience with a particular truck. Here, very likely, we may find the reason why some trucks have larger motors (in proportion) than others, and why a large majority of our trucks are burdened with so large a motor. Those particular trucks need the large motor, or their designers do not see how they can get along with a smaller one. The proper compromises have not been adopted or data is lacking to warrant them in risking the production of an underpowered car. That underpowered bogey of the pleasure car designer must be overpowered before it has a chance to give a most promising young industry a further setback. The surrounding conditions here are different and must be dealt with in the light of different ideals.

Calculating Resistance Factor

CORNELIUS T. MYERS, in summing up contents of his paper entitled "Comparative Data on Performance of Motor Trucks with Regard to Size of Motor and Gear Ratios" stated that the whole situation was in equating the resistance factor to the tractive factor at the point of ultimate attainment of the truck. The fact that his formula was made up of figures taken on the safer side is shown by the fact that where his tractive factor was calculated at .0286 with a motor measuring 4.5 inches mounting a .03 grade on a brick pavement with a resistance factor of .01 or a total resistance factor of .04.

He stated that his formula was assumed as to factors of tractive effort so as to reduce all motors on the same basis in the efficiency of transmission from motors to road wheels with double chain drive trucks, the only kind considered in the paper was 70 per cent., and added that at the same time he believed this assumed efficiency to be too low, but it was that generally taken in designing trucks of this type.

Foreign Tendency of Motor Truck Design

By Lowell C. Freeman

IT might as well be admitted in the beginning that the data presented in this paper do not justify the use of its comprehensive title, which was selected in sheer desperation after a futile search for one more expressive of the true character of the text. It is simply an attempt to set forth

some of the details of design which are most interesting, together with some comments on their advantages and disadvantages, as they appeared to the writer in a recent trip abroad.

A composite picture of the predominant English motor trucks would show the motor under a hood in front of the seat as in conventional pleasure car practice; a cast-tank built-up radiator in front of the motor; right-hand drive; fixed spark magneto ignition; thermosyphon cooling; three-speed transmission; cast steel plain-bearing wheels; rear springs taking both drive and torque; both brakes on rear wheels, and worm, pinion or chain final drive. No one particular make embodies all these features, but they represent the writer's impression of the English truck, crystallized from information obtained and observations made.

Solderless Radiators Successful

There seems to have been a nearly universal and simultaneous adoption of the cast-tank built-up type of radiator. The top and bottom tanks are made for the most part of aluminum, the top tank being in some cases ribbed to secure increased radiating surface. The radiator seems to have the following points in its favor: It has very few soldered joints as compared with the "tin case" type, as the Englishmen call it, and the joints are stressed very little or not at all, as any forces acting on the radiator are transmitted through the side bars to the comparatively rigid tanks, and as long as there is no movement of the bolted joints or deflection of the tanks and side bars, the soldered joints cannot be stressed except by the action of inertia forces set up by the core itself. The filler and inlet and outlet connections may all be cast on the tanks if desired, while the side bars may be designed easily for practically any form of support. Hood ledges may be cast on, thus doing away with the trouble caused by relative movement of the hood and radiator cutting the sheet metal ledge. The core may be of any type whatsoever, either cellular or vertical tube; the latter either with or without fins as the individual designer may prefer.

It would seem that cast iron could be substituted successfully for aluminum if the percentage of efficiency per pound of weight were not considered important. The weight and cost of an aluminum-cast-tank radiator should not exceed greatly that of the usual type of the same capacity and efficiency. The greatest advantage, however, would be to the user. The cores can be made strictly interchangeable if master spacers are used in assembling, and as the cost of the core, which is the only part ordinarily liable to damage through accident, will be about 50 per cent. of the total cost of the radiator, the user's repair bills due to accidents to this part of his car will be cut exactly in half.

The fact that an ordinary wooden block seems to make a sufficiently flexible support is eloquent testimony of either the strength of the radiators or the excellence of the roads in England.

Brake hand-levers are big two-handed affairs that look as though they were really to be used for braking and not merely as locks to hold the car when standing still. There seems to be a marked tendency to place both service and emergency brakes on the rear wheel hubs, which I believe was originally a purely American construction. All brakes noted were practically without exception of the internal-expanding type with metal-to-metal and lined shoes apparently in about equal favor. The brakes were in most cases cam-expanded and usually equalized, some of the mechanisms to accomplish this being very ingenious.

Plain Floating Bushings Favored

Plain floating wheel bushings seem to be perfectly satisfactory, with low first cost, non-adjustability and cheapness of replacement as big points in their favor. Some have hardened sleeves in both the wheel hub and on the axle, while on others the bushing rotates on the soft axle. There are several different methods of lubricating, all of which seem to work very well and apparently considerable variation in design is allowable without materially affecting the service obtained.

While cast steel wheels seem to give very good results under certain conditions, they do not appear to be a universal panacea for all wheel troubles. One user who has operated a great many trucks of many different makes said that cast steel wheels were all right until the tires

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FOLLOWING the reading of L. C. Freeman's paper, Slade discussed the need of more power in America on trucks than would be required in Europe and stated that at least 50 per cent. greater power of motors was required to carry a given load here than abroad on account of the difference in road conditions. Perkins, in comparing the widely varying conditions to be met in America with the more or less uniform requirements in Europe, stated that a motor which was suitable for one part of the country would be entirely inadequate to meet the requirements of another section. He suggested that motors of different sizes and horsepower be made with standard attachments to the chassis in order that these two motors would be interchangeable. It was also brought out that the motor truck was essentially the vehicle of good roads, and that where road conditions were poor the motor truck could not be made to pay. Also that the present motor is too large, for we do not need bigger motors here than in Europe, and, differing from Mr. Slade in this respect, Perkins prophesied that in a few years the motors will be the same size here as in Europe, and stated that commercial vehicles are run faster here than in Europe and much too fast for economical operation.

R. L. Morgan announced that the practice abroad was to keep motors as small as possible, that the underpowered truck, like the underpowered touring car, cannot attain great speed, but will stand up. B. B. Bachman stated that it was necessary to allow for average conditions in a motor designed to accommodate the demands of the truck buyer. In that respect it was necessary to have a motor which would have more power than necessary on good level roads, or small hills, and which would be somewhat underpowered on steep hills and very rough country. The heavy motor worked against this in that it meant heavier parts and hence actually required a higher power to carry it along. Mr. Bachman stated that he was a thorough believer in a small motor for commercial service, that economy was one of the most vital items, nad that was in direct relation to the motor size, that the big motors were more expensive in the fuel used per ton mile. This precipitated a general discussion in which it was brought out that possibly the reason for the employment of small motors in Europe was the question of economy, particularly since the cost of fuel over there was considerably greater than it is in America. It was also stated that the sale of trucks was restricted to a definite locality and that trucks could be built to meet definite conditions and be of less power than could those built to overcome such widely varying conditions of loads and grades as are met with in the localities where American trucks are marketed. It was declared that the power of motors obtained from Myers' formula would work in all parts of the country. In reference to this Myers stated that the relation of motors to truck size all goes back to the question of weight, that the question was to obtain pounds of effort per pound of weight, that by his formula all the various resistances, such as load resistance and so on encountered in service, could be reduced to a total tractive resistance.

Discussing Low-Grade Fuel Paper

The discussion of N. B. Pope's paper taking up the question of fuel for commercial vehicles brought out the fact that there were motors running on low-grade fuel. One was mentioned which has operated ever since it was manufactured on nothing but the low-grade fuel. This was also used by two concerns on the Pacific Coast which had never used anything else but the lower-grade fuel. While discussion was in progress on this paper, R. L. Morgan stated that he had observed a casting in which an electric coil was placed in a passage below the venturi and which permitted a start, with the low-grade fuel, 20 seconds after this coil had been thrown in.

Cornelius T. Myers, the author of the previous paper, had reduced his resistance factor to the figures shown in the discussion of the comparative data on Performance. He naturally worked on the basis that the tractive effort must equal the resistance or the truck would not be able to navigate. The discussion on this paper reflected back on Mr. Myers' treatise and brought out the fact that very few of the truck manufacturers, if any, had gone into the matter with a formula. Another point which was brought out was that the fuel consumption was of such importance that it was extremely necessary to cut the motor size to the utmost limit. The author of the paper, in speaking of this phase of the situation after having read the paper, stated: "The weight of the motor increases proportionately with its power. Therefore we have not only added power, which is necessary, but also an added weight, which renders it still more necessary to carry excess power." Several of the members present commented on the stand taken by the French and English war offices in subsidizing motor trucks. The fact that the English war office has only subsidized the bevel drive while the French war office refuses to subsidize the bevel drive was especially noted.

Comparing Pneumatic and Solid Tires

The last paper to be presented at the session was a discussion of truck tires by B. B. Bachman. The paper was entitled "Comparative Results with Solid and Pneumatic Tires on Light Commercial Vehicles." Bachman stated that his paper was a summary of results on one make of truck, 3,000 pounds capacity. Bachman stated that the comparative cost per mile with solid tires against pneumatic tires was 3 cents a mile for the solid and 5 cents per mile for the pneumatic. When the car maintenance action was considered it was found it was nearly 50 per cent. greater for the solid tire as compared with the pneumatic and that it was a 30 per cent. saving of gasoline in favor of the pneumatic-tired trucks. In fact, in all respects except tire maintenance the figures were in favor of the pneumatic.

Bachman completed his remarks by stating that the pneumatic tire for truck service has been given a black eye by most users on account of the very general under-tiring of trucks and excessively high speeds at which they are operated. In the discussion of this paper Mr. Myers suggested that the proper tire equipment and particularly the trouble with the pneumatic to date was a question of two things. First, that the tire pressure advance employed is not sufficient, that greater tire pressure is needed for the same size of tire in commercial vehicle service than is used for pleasure cars, and second, cost.

Tests on factory trucks showed an increase of tire cost with pneumatic but a lower maintenance cost. It was generally brought out as far as engine cost was concerned that the balance was in favor of the pneumatic tire on smaller trucks which were run at fairly high speeds. The vibration of the motor truck was stated to be its one weak point and in the lighter vehicles where the cost of pneumatic tires would not be beyond reason, they were in the long run more economical.

Slade inquired as to whether there were any cushion tires which were interchangeable with the present solid tires for motor trucks. This was

wore thin. In this statement I think there is food for a great deal of thought. A built-up wheel of structural steel was giving him excellent service and almost no trouble.

The usual mounting of the chassis is on four semi-elliptic springs, although some cases of three-quarter fronts and semi-elliptic rears were noted. French designers seem to favor wider springs, the average being 25 per cent. wider than on the English cars of the same capacity.

The most interesting point is, however, that both torque and drive are taken through the rear springs, with evident success. There is possibly a little more trouble with the springs, but none at all with radius and torque rods and their attendant fittings. It has evidently been found that the maintenance cost of a Hotchkiss-drive truck is less than of one with radius or torque rods or both; the first cost is certainly less. This is the true test of the worth of a design—does it make the total cost of operation minimum? In the case of one truck noted it was a question as to how the torque was taken, as the long reinforced-wood radius rod flexed so much under load that the springs must have taken some of it.

Starters Progress Little Abroad

An interesting commentary on the favorable conditions for motor truck operation abroad is that a pleasure car chassis with a van body seems to make a perfectly good truck with a capacity of about one ton for retail delivery.

The opinion was advanced in some quarters that the three-wheeler is the solution of the problem of satisfactorily and economically replacing one horse with a motor vehicle. It is a question, though, whether it could be operated at a lower cost than a certain-priced American car, when "operated" is taken to mean the entire cost of the service.

In London there does not seem to be much attention paid to motor starters, and less still in Paris. In both cities traffic is about as badly congested as could be imagined, and it would seem that if motor starters were worth while at all, such a condition would hasten their adoption. The answer probably is that more is lost than gained by their installation.

In regard to the final drive, there seems to be more unanimity of opinion than there is in the United States.

In England the worm has a shade the better of the argument at present, but is not gaining ground very rapidly; while in France, judging from the exhibits at the Paris show, it is not considered seriously. One of the advantages of the worm drive is, of course, quietness, but the pinion-drive Schneider buses in Paris are certainly as quiet as could be asked. Any one of the four types of final drive which are at the present time considered as possibilities, undoubtedly has certain points of superiority over any or all of the others, but is also subject to troubles which are peculiar to it and not found in the others.

Opinions Are Divided on Driving

Let us sum up the situation. When all the good and bad points of each are balanced, it will be found, everything considered, that no one of them is from the user's point of view so very much superior to the others. This was borne out by the things the writer saw in the different repair depots and garages which he visited and by the statements of the men with whom he talked. Each, of course, had formed his own opinion from experience with the various types, but the opinions and experiences were by no means uniform. Thus, of four different men interviewed, each of whom had had about the same amount of experience with the different types but under different conditions, one pronounced the chain drive to be still the most satisfactory; another was very enthusiastic about the worm; the third was best satisfied with the results he had obtained from the pinion drive; while the fourth was very strongly impressed with the possibilities of double reduction. So, while beyond question fairly good and consistent results can be obtained with any of the types, it seems that no one has yet been developed to the point where it is all roses and no thorns, and that considerations other than those of a strictly engineering or technical nature will in the immediate future largely influence the choice of the type of final drive in new designs. Ultimately, of course, the design which will give the greatest number of users the maximum of service for the minimum cost will be the one to survive in the long run of operations.

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followed by a statement that shortly one company was to put out cushion tires which could replace the solid, and this statement by expressions of widely varying opinions as to the relative efficiency and economy of the cushion and filler tires versus the solid tires.

The discussion was then turned to the subject of worm gears. Henry Souther, who had made a study of this subject while on a recent trip abroad with the American engineers, stated that while the manufacturers were in agreement as to the specific composition of the worm gear they did agree that the best results were obtained from hardened steel against bronze, the steel being of course the worm member. In some cases he went on to state where the bronze was not of the proper composition it has been known to flow under the pressure of the worm, and that the bronze should resist peening. He also added that the worm gearing as a whole required very careful machining and is known to obtain satisfactory results, and that the only disadvantage of the straight worm over the hourglass type is the resistance load clearance provided when the worm is under the axle.

Mr. Burgess stated that worm drive had proven successful in Europe and that it was being developed here, that the issue could not be pushed, but the adoption of worm was a question of time. "It must be given a chance to grow. Mr. Burgess stated his belief that a worm gear, contrary to present practice, would be employed most extensively on trucks. He stated that simplicity was an issue, and that for success a device must have the minimum number of bearings, but that so far as worm gears were compared it was only a matter of cutting the worm teeth correctly, and that they required the development of special machinery. At present the engineers have not as yet had time to develop this phase properly. He stated that the Hindley shape of tooth will make a successful worm, that the nearer you get to the flat tooth the better efficiency, better lubrication, longer wearing qualities and less heat will be obtained.

C. T. Myers said that it must be remembered that the commercial vehicle industry is not the same as the pleasure car field, that designers must not go too fast but must work for a simple design of vehicle. He stated that the worm was less simple than the chain drive and had the further disadvantage of increasing the nonspring weight on the rear axle. He concluded by saying that the new ideas are good and that engineers should sit down and think about them but go slowly in their adoption.

Mr. Buckwalter then made the remark in referring to the several references to different formulæ throughout the discussions of the evening that it was his belief to accomplish anything practical by the mere use of a formula. Mr. Alden in replying to this stated that a formula was necessary in order to make a start and that it would be nearly blind work to attempt to proceed without them. The discussion on starters for motors was then opened.

Morgan Argues Against Truck Starter

Mr. Morgan stated, in discussing truck starters, that in his belief it was best to leave off the starter because if he hired men husky enough to handle freight and found that they were too lazy to turn over the motor he would get rid of the men. He also stated that on the truck simplicity was the biggest feature of design. Every part which could be left off without affecting the effort of the truck was so much gained. This was in his opinion the case where the larger trucks were concerned. There is not the need of economy of time. A motor starting on the smaller size that there is in the larger size of trucks because the non-production during the time the truck is idle is not so great in the smaller sizes. Mr. Cohan remarked that one reason that the electric truck is supreme in certain fields is that it is easily started, and said that when gasoline trucks become easy-starting it will improve on the field of the electric. He went on to say that huskies do not make the best drivers, and that the driver that is torn between duty in saving gasoline for his employer and letting the motor run to save his elbow is likely to take the former alternative unless the motor is equipped with a starter. Mr. C. T. Myers added that he had found starters not desirable and not in great demand for vehicles of over 1-ton capacity.

Bowers Declares Metal Wheel Useless

A general discussion then followed on the simplicity of motor trucks. It seemed to be the general opinion of the members who entered into the discussion that simplicity should be a cardinal factor. The discussion of the subject of metal wheels involved a wide variance of opinion among the truck makers and engineers present. Mr. Bowers, one of the wheel makers, stated that it was his belief that the metal wheel is utterly rigid, non-resilient and hence devoid of practicability.

It was stated that wood wheels used on trucks were found in many cases to be from .125 to .25 inch out of round, while the metal wheels would stay true. It was stated that the manufacturers of wood wheels have not developed with the truck industry and that the heavy weight causes many of the wheels to fail. Mr. Bowers responded to Mr. Morgan's criticisms by saying that wood wheels were now manufactured which remained perfectly true and which gave excellent service inasmuch as they possess resiliency, and thereby absorbed the road shocks and cut down to a remarkable degree the cost of upkeep on the entire car. The ensuing discussion brought out the fact that the members were in agreement in stating that excess weight must be guarded against. Some agreed that they had broken more axles with solid wheels than with the wood wheels while others claimed that, owing to bad wooden wheel construction, the life of the tire was shortened on the latter type. The difficulty of securing light castings was also mentioned. Mr. Haynes stated that it was his belief that the cast steel wheel would supersede the wood wheel in time, inasmuch as cast steel wheels can be made if the same material is employed as is used in making wheels for railroad cars.

A doubt was expressed as to the advisability of taking up the metal wheel inasmuch as the railroads were looking to the paper wheels. Mr. Bowers said that it seemed that engineers in the discussion have lost sight of the necessary balance of car and parts in considering the metal wheeel.

Cornelius T. Myers, the author of a previous paper, had reduced his resistance factor to the figures shown in the discussion of the Comparative Data on Performance. He naturally worked on the basis that the tractive effort must equal the resistance or the truck would not be able to navigate. The discussion on this paper reflected back on Mr. Myers' treatise and brought out the fact that very few of the truck manufacurers, if any, had gone into the matter with a formula. Another point which was brought out was that the fuel consumption was of such importance that it was extremely necessary to cut the motor size to the utmost limit. The author of the paper in speaking of this phase of the situation after having read the paper, stated, "The weight of the motor increases proportionately with its power. We therefore not only have added power which is necessary but also an added weight which renders it still more necessary to carry excess power."

Digest of the Leading Foreign Journals

Points To Be Observed in Adopting Silent Chains for Camshaft and Magneto—Their Effect on Valve and Spark Timing—Graphic Method for Comparing Results Obtainable with Fire Engine Equipments Before Ordering Them

Silent Chains in Motor Construction.—As silent chains of the Renold and similar types have been used only very sparingly in German automobile manufacture but are now under consideration by reason of the fashionable demand for noiseless operation, some observations with regard to their use in motors, mainly for driving the camshaft and the magneto, are offered the German public by Engineer L. Merz of Charlottenburg. Hans Renold Ltd., Coventry Chain Co., Westinghouse Railway Brake Co. (of Hannover, Germany), F. Stolzenberg & Co. and W. Wippermann, Jr., are mentioned as the sources of supply, and especial attention is called to the Westinghouse chain which is made under Morse patents and has fixed chainbolts, each made in two parts of which one rocks upon the other. The other models are considered as equivalent in design if not necessarily in quality.

The following summary of the information imparted in text and illustrations may be of general interest:

The silent chains used for motors have usually a one-half inch (12.7 mm.) pitch, but some as small as 8 mm. and also some larger ones are used here and there. The width, which is produced by the combination of a smaller or larger number of link plates of like thickness, varies, and it is to be noted that by some of the manufacturers the outer guide plates, which prevent lateral displacement of the chain upon the sprocket wheel, are not counted in the width, while by others they are counted. A single central guide plate in each link, riding in a groove in the sprocket wheel, is not considered as reassuring as the more customary design.

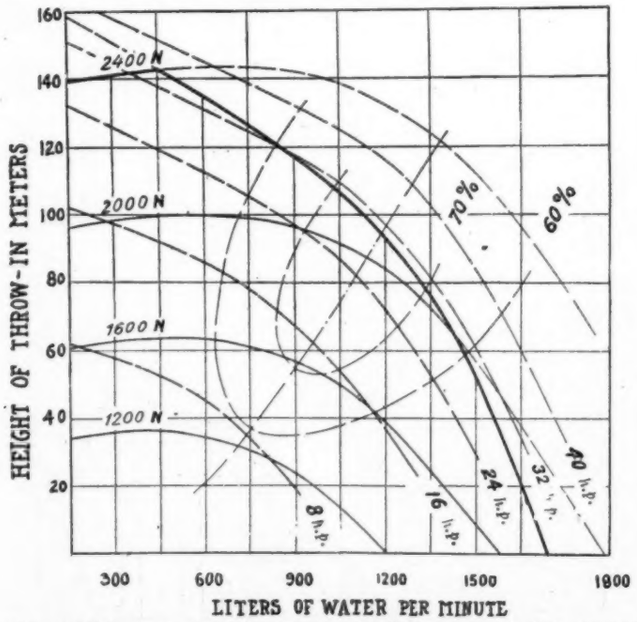

Fig. 1—Operating conditions and working range of fire engine driving centrifugal pump from automobile motor

The principal advantage over gear wheels is the silent running. Further, the time-consuming training of the gear wheels by running them in mesh on a test stand is obviated; the distance between shafts need not be so scrupulously accurate as with gears and the cost of assembling and testing are correspondingly reduced.

When only one camshaft is to be driven it should be located so that the chain runs more nearly horizontally than vertically. One shaft can never be vertically above the other as the slack must be on one side only and not at the teeth in engagement. The chain should be chosen so it can have an even number of links, because, with an odd number, the free ends cannot be joined without using one link with bent and divided plates, and a link of this kind is liable to stretch unduly. Manufacturers consider 15 to 17 the low limit for the number of teeth on the smallest sprocket wheel, and Renold goes further, recommending 21 and 42 as the most favorable numbers for camshaft driving. The Coventry company makes chains of special design for wheels with down to 12 teeth. The small wheel should always have an odd number of teeth (a "hunting tooth") so as to distribute wear on all links and teeth equally and independently of the inequalities of the work.

The distance between the shafts or the length of the chain is obtained from the formula:

$$L = 2A + \frac{Z_1 + Z_2}{2} + \frac{(Z_1 - Z_2)^2}{4\pi^2 A}$$

in which L is the number of chain links, A the distance between shafts in number of pitch unit lengths, Z_1 the number of teeth in the big wheel and Z_2 that of the small wheel.

Certain peculiarities of sprocket chains make it undesirable, it seems, to use them without a tension idler, especially for large motors. The chains, as they come from the factories, never correspond accurately to the length arrived at by multiplying the pitch by the number of links. According to Renold's own statements, the greatest care in manufacture still leaves an average difference of 0.025 mm. in the length of links, when the total lengths of two chains, which should be alike, are compared. It can therefore happen that new chains refuse to fit upon a construction laid out according to the above-mentioned formula. Hereto comes the fact that chains stretch. During the first 100 hours of use the stretch amounts to from 0.2 to 0.4 per cent. After this first "settling" of the chain, the stretch by wear sets in but amounts to only about a one-hundredth part of the figures mentioned, for the same amount of work. Some manufacturers therefore sell pre-stretched chains. Nevertheless, the conviction is growing that a tension idler is the best remedy for the troubles referred to.

An idler must always work on the slack side of the chain, and the adjustment-eccentric must be so used that the pull of the chain cannot draw the adjustment tighter but only looser. According to experience, the idler must work on the inside of the chain and must be shaped accordingly. It should engage at least three links of the chain. Adjustment by hand rather

than by means of a spanner is of advantage to guard against too great tightness.

If not only one camshaft but perhaps two, and perhaps also the water pump and the magneto, are to be chain-driven, it is advisable to use more than one chain in order to avoid excessive lengths, by which the wear accumulates too fast. Usually a broad chain is used for the camshaft and a narrower one for the magneto. If a single tension idler is used for both these chains, it is to be foreseen that they may not stretch equally. The idler should therefore be so mounted that, when tightened, it will distribute the tightening effect automatically between the two chains. This may be done by means of a double eccentric, one concentric with the other, of which only the inner one is adjusted.

By reason of the chain stretch and the adjustments made to keep the tension right, the adjustment of the camshaft becomes gradually inaccurate, and it is therefore recommended to mount the camshaft sprocket wheel crown upon a flanged spider rather than direct upon the shaft, and to provide the sprocket wheel crown with oblique slits—say three of them—and the spider with similar slits running crosswise of those in the crown. By securing a bolt in each pair of slits, the crown and the spider are joined, and when the timing of the cams becomes inaccurate it can be corrected by loosening the bolts, turning the crown around the required small angle with relation to the spider and securing the bolts again at the new intersection of the slits.—From *Allgemeine Automobil-Zeitung*, January 3.

—

WORKING Range of Centrifugal and Pittler Fire Pumps.—Since it has become known through the developments in German fire-fighting practice that the greatest simplicity, economy and efficiency are obtained by coupling a rotary pump with the same internal-combustion motor which is used for propelling the fire engine vehicle, the data which should govern this combination of elements have been studied by all those members of the automobile industry who turn out commercial vehicles and who realize that the type of fire engine referred to is the only one which can be turned out in an automobile factory without interference with other routine production and that it, in fact, can be turned out there better than in any other industrial establishment. The desire to utilize old steam pumps, chemical engines and other material on hand for its allotted time and for keeping the equipment of each fire station uniform and unmixed, remains the only factor which can retard the new development, provided the working data of the simple new type of fire engine are made known and the most suitable construction is adopted by those who produce it.

Having in mind this situation, so interesting to the automobile industry as well as to insurance companies and the public, Engineer Hüpeden of Wiener Neustadt presents a comparison of the working results which may be obtained accordingly as the rotary pumps used are of the centrifugal and non-positive variety or of the design devised by the late v. Pittler, which may be designated as a rotary piston pump and is almost positive in action. These data gain further interest because the limitations of the Pittler pumps are found considerably aggravated in pumps with reciprocating piston action, if these are driven from an internal combustion motor, while their advantages are not similarly emphasized.

The accompanying diagrams, Figs. 1 to 5, summarize the findings and conclusions of Mr. Hüpeden which are reproduced in substance in the following:

The pumping work of motor fire engines is still too frequently estimated according to the height and reach of any stream thrown at a demonstration trial. While larger fire departments stipulate the amount of water which must be discharged at a given pressure and compliance with this condition may be readily tested out, it does not exhaust the requirements which must be made with regard to the adaptability of the pumping equipment to the widely varying conditions which may arise in fire-fighting work. The producers of motor pumps are often themselves not well informed with regard to this adaptability, as the pumps and the motors usually come from different factories between which the needed exchange of information is incomplete, while the time for searching trials of the completed apparatus is usually lacking. But a pre-determination of the working conditions is so important and decisive for the design that it seems very desirable to have made clear in words and drawings the mutual relations existing for the three elements: the pump, the motor and the work.

In order to represent actual conditions, the curves must show the work done not at only one but at a number of different pump speeds (N in the diagrams). So far as centrifugal pumps are concerned these data are now usually obtainable, and in addition there has recently appeared (in *Zeitschrift des Vereines Deutscher Ingenieure*, 1912, No. 47) an article by H. A. Janssen giving a new method by which all necessary details of the working results with rotary pumps may be deduced with sufficient accuracy from fragmentary data. The curves which may be drawn according to this method agree very well with the test results which have so far come to notice in practice and diagrams. The curves in Fig. 1, representing the work of a high-pressure centrifugal pump, have been drawn according to this method. They show directly the mutual relations between number of revolutions, capacity, throw and efficiency. [The word "throw," as used here and in the diagrams, inaccurately, does not refer to the stream thrown from the nozzle of the hose but to the height which the nozzle will deliver a stream.—Ed.] The power necessary throughout this range of conditions has been calculated in each case from the other data and entered upon the diagram. The pump chosen for illustration was a medium large one rated to give 1200 liters of water per minute at 8 atmospheric pressures. In practice the pump dimensions are properly so chosen that the demanded capacity falls within the limits of the maximum efficiency, corresponding to 70 per cent. in the diagram. When this is done, the required horsepower may then be read on Fig. 1 directly.

Fig. 2 shows the torque curve of a gasoline motor selected to suit this power requirement. It can be drawn with sufficient accuracy from a few data giving the power at different motor speeds. Usually the pump and the gasoline motor are designed for different speeds and a gear must be used to equalize them. There is then available for driving the pump only the motor power minus the friction loss in the gear. This loss, estimated at 10 per cent., is therefore entered upon Fig. 2. The gear ratio is in the present example taken to be 1 to 2.

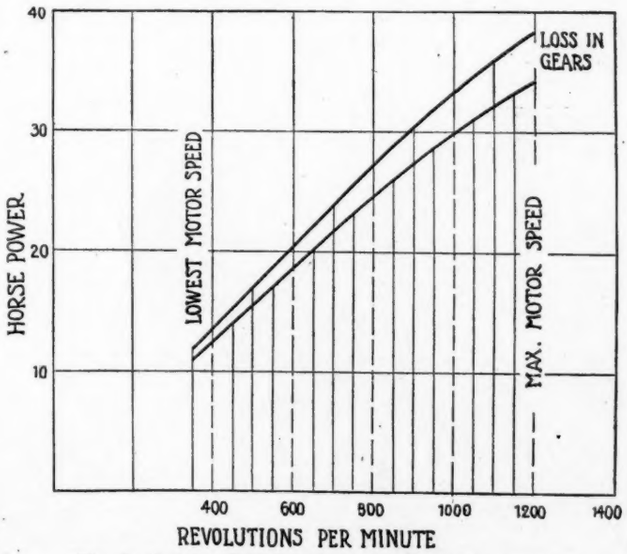

Fig. 2—Curves of motor power available for pump

When now the maximum torque of the motor at different speeds is carried into the diagram of the pump curves, Fig. 1—by connecting those intersections of revolution and capacity curves which according to Fig. 2 belong together, there is obtained the curve which is drawn thickest in Fig. 1 and represents the maximum obtainable performances of the whole motor pump for the complete series of working conditions.

All performances ranging below these maximum values can be obtained by simple throttling of the motor.

While in the case of stationary pumps the fuel efficiency of the motor is an important factor, it is of no consequence in fire engine service except in so far as it influences the range of performance. The latter, on the other hand, is a main issue, as the performances demanded vary very widely. An incipient fire in a dry-goods store, for example, should be extinguished with a discharge at the nozzle of, say, 200 liters per minute, in order to minimize the damage from water, while a fire in a warehouse should usually be fought with a maximum quantity of water. Similar differences apply to the pressure. While a cellar may be inundated with the smallest expenditure of motor power, churches and other tall buildings may demand a pressure of more than 100 meters. The adaptability of the pumping engine to these varying requirements is shown exhaustively by the curve of maximum performance in Fig. 1. It shows, for example, that the 200 liters per minute for the incipient store fire can be delivered at a pressure of 6 atmospheres (60 meters) with the motor throttled to 800 revolutions, giving 1600 revolutions for the pump; also that the cellar may be flooded with 1500 liters per minute at the same pressure and that, in the case of the church or high building, 300 liters can be delivered against 140 meters and about 800 liters against 120 meters pressure.

Other inferences from the performance curves are made clearer by a comparison with the results obtained with the rotary piston pump; a type designed by the late W. von Pittler and subsequently improved. As it gives results very similar to those obtained with the high-speed pumps with reciprocating pistons which have lately been employed in a few places, the remarks to be made with regard to it apply in the main to the latter as well. Fig. 3 shows the operating conditions of a Pittler pump. The curves showing performances at equal speeds deviate from the vertically running lines representing equal capacities only by reason of the volumetric losses sustained in the motor at the higher speeds, so that the capacity is almost proportionate to the number of revolutions. The efficiency increases with the pressure but drops with the number of revolutions. On this point no data from tests have been found obtainable because the motors used for factory tests were lacking in the required flexibility. But as the efficiency is of subordinate importance—within certain limits—the efficiency curves drawn into the diagrams, from such data as could be had, will be sufficiently accurate for the desired comparison.

By carrying the torque values from the motor diagram, Fig. 2, into the pump diagram Fig. 3, in the same manner as they were marked in Fig. 1, the complete working range for a fire engine with Pittler pump can now be shown, the pump dimensions being selected, for the purpose of a comparison on equal terms with the centrifugal pump, so that the normal performance is the same in both cases, this performance being taken as the delivery of 1200 liters per minute at a height of 80 meters, and the motor being the same.

The curves obtained in this manner, by combining the values of Fig. 2 and Fig. 3, and representing the working range of the Pittler pump is reproduced in Fig. 4 together with the corresponding curve for the centrifugal pump equipment from Fig. 1. The full-line represents the results of direct drive of the pump and the nearest broken line those obtained with a driving connection geared up in the ratio of 1 to 1.2. By the choice of gear ratio the working range of a Pittler pump may be materially changed, as further shown in Fig. 5 which is drawn on a basis of a 1 to 2 ratio of the gear. There is, however, a limit to this method for adapting the equipment to special requirements through the fact that the speed of a Pittler pump, in its present development, cannot very well exceed a certain maximum, which lies somewhere between 600 and 1000 revolutions per minute, by reason of the inertia of its unbalanced masses. If this maximum speed, which is taken as 1000 r.p.m. in the diagrams, is lower than that of the motor (here assumed to be 1200 r.p.m.) the highest power of the motor cannot be utilized by a direct-driven pump, but in practice the difference in best motor speed and best pump speed is often so small that, for simplicity's sake, the direct drive is preferred, even though a loss in working range and reach is involved.

With centrifugal pumps a best gear ratio cannot be in question. If the curves for any given equipment are plotted out as in Fig. 1, the gear of the drive can always be chosen from these curves, on the plan that the highest motor power should coincide approximately with the highest pressure requirement and with that capacity, in liters per minute, which is selected as minimum. Other gear proportions would only contract the working range without adding materially either to pressures in one direction or to capacity in the other.

The difference in the working ranges of centrifugal and of positive pumps operated under the same motor conditions is striking. The reason lies in this that the resistance-moment (which determines the efficiency) in the centrifugal pump drops by reduction of its delivery-rate even though the pressures are correspondingly increased, and thus the motor can reach higher speed and produce its highest power against the highest pressures. The resistance in the Pittler pump, and in ordinary piston pumps, on the other hand, increases with the pressure, so that the performance of the motor drops off when the water has to be

(*Continued on page 357.*)

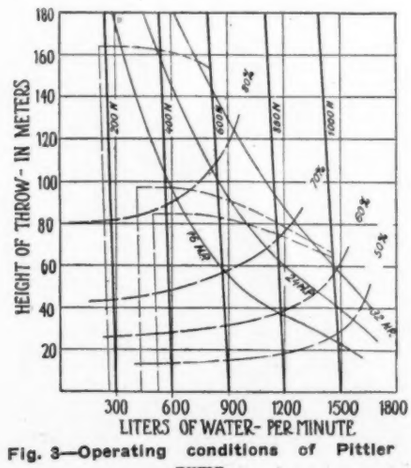

Fig. 3—Operating conditions of Pittler pump

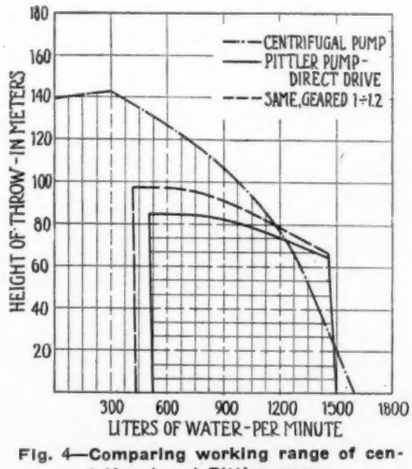

Fig. 4—Comparing working range of centrifugal and Pittler pumps

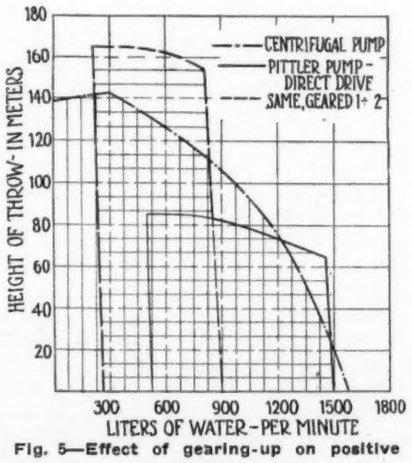

Fig. 5—Effect of gearing-up on positive pumps

The Engineers' Forum

Front Wheel Design

Bearings Must Carry Part of Car Weight and Withstand Centrifugal Force at Turns

TOLEDO, O.—Editor THE AUTOMOBILE:—It is customary in choosing bearings for the front road wheels to estimate the weight on each wheel and then select bearings of such a size as to safely carry their proportion of the load, this proportion being determined by their respective distances from the vertical center line of the point of contact of the wheel with the road. As the wheels are usually tilted this center line does not always coincide with the center line of the wheel. As this selection is usually modified by judgment and a large allowance made for safety the bearings chosen for this work are usually ample. This is attested by the fact that the bearings in the front wheels of the present day cars give very little trouble indeed.

I wish to show the action of the forces involved and the pressures they produce on the bearings.

The front wheel of a car is acted upon by two forces: First, the force due to the weight of the car, and second, that due to the inertia of the car when making a turn. By the graphical solution of forces we may compose these forces into a single resultant. This is shown Fig. 1. In this figure the force F is shown acting upward. This upward force will be equal and opposite to the downward force and is equal to the reaction of the road on the wheel.

Fig. 1 shows a wheel in which the thrust is taken on the inner bearing. In this case the hub will pivot about a point somewhere near the center of this bearing. This point will be the center of moments. The force F will produce a moment about this point which will be equal to the product of this force multiplied by the perpendicular distance from the line of action of the force to the center of the inner bearing. This distance is denoted by L, Fig. 1. This moment will be resisted by an equal and opposite moment which will be equal to the product of the pressure on the outer bearing, multiplied by the distance between the bearings. This distance is denoted by D, Fig. 1.

From this we get the following formula for the pressure on the outer bearing: $P = \frac{FL}{D}$

The inner bearing will be acted upon by two forces, one of which will be equal to the force F and acting in the same direction. The other is equal to the reaction of the pressure on the outer bearing and acting vertically. These two forces may be composed to form a single resultant by the graphical method. This is shown at R, Fig. 2. This resultant may be again resolved into two components, one vertical and the other horizontal, shown at C, Fig. 2.

By reference to this force diagram it will be noted that **the vertical pressure P is equal to the sum of the force P and the vertical component of the force F, which is the weight on the wheel.** Then for the pressure on the inner bearing we get the formula: $P_1 = W + P$.

The thrust will be equal to the centrifugal force CF.

The magnitude of the force F will depend upon the proportion of the weight of the car that rests on this wheel when the car is turning. This cannot be very closely estimated and is a point open for argument. The proportion of the weight that rests on the front wheels when the car is standing still or traveling straight ahead may be easily determined, but as soon as the car begins to turn a greater proportion of the weight is thrown upon the front wheels, due to the inertia of the car.

It is generally conceded that the maximum coefficient of

(*Continued on page 357.*)

Centrifugal Force of a 3,000 Pound Car on Turns of Different Radia at Various Speeds.

Speed in m.p.h.	Radius in feet		
	200	150	100
5	25.1	33.6	50.4
10	100	136	210
15	226	310	450
20	411	535	807
25	625	835	1250
30	895	1215	1820
35	1210	1641	
40	1670		
45			
50			
55			
60			

NOTE.—When the centrifugal force exceeds .6 of the weight of the car it is not given.

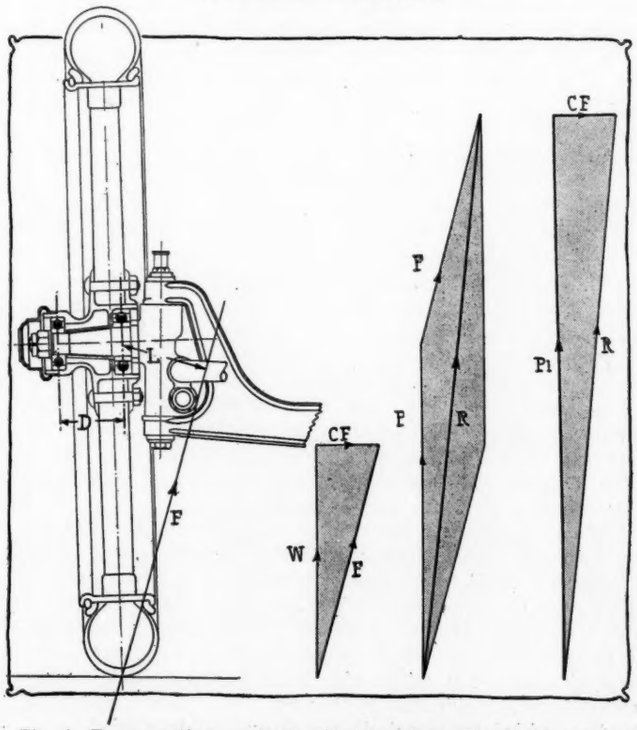

Fig. 1—Forces acting on front-wheel bearing. Fig. 2—Diagram of forces, showing components

Explaining the Differential—Reader Offers Suggestion—Discussion on Duryea Rotary Valve Continued—Some Points on Multiple Series—How Horsepowers Are Rated—Use of Two Flywheels—Making Oil Tests

Differential Action Explained

EDITOR THE AUTOMOBILE:—Define the construction of a full-floating rear axle ball bearing?

2—In jacking up my car and inserting into lower gear and running motor, one wheel will run much faster than the other. Explain why this is so.

Shinnston, W. Va. BROOKS F. MARTIN.

—1—The floating rear axle is one in which the load is carried by the housing of the axle. The driving members do not aid in the support of the car. The ball bearings used in supporting the driving members of a floating rear axle are of the annular type. The balls revolve between two cylinders. The cylinders are known as the inner and outer races. The balls are held apart so they cannot run upon each other and they are also held so they cannot fall out. The part holding the balls in place is known as the retainer or cage. These bearings are known as the annular type. They are designed to take a load in the direction of the radius of the bearing. They are capable, as a general rule, of sustaining an endwise or axial load of 10 per cent. of the radial load.

2—The reason that one wheel turns more rapidly than the other is because the resistance to turning of one was greater than the other. This might be due to a dragging brake shoe. If the resistance to revolving were equal on both wheels they would both turn at the same rate. On the other hand, if you jacked up but one wheel and started the car, the wheel that was in the air would revolve while the car would remain stationary.

Offers Valuable Suggestion

Editor THE AUTOMOBILE:—I would like to offer a suggestion as a source of help to garages and repair shops and owners through your columns. I would suggest in each issue that you set aside one sheet dealing with and giving some information on different subjects. For instance, ignition systems, their wiring; suggestions for locating trouble on same and the correcting of same. After exhausting the electrical end resort to other parts such as transmission, giving the names of manufacturers of parts, showing a clear cut of construction, different views where necessary. This would be of great value to repair departments where various types of cars are handled. I should think it well to run back to the early days or start back about 6 years and work up on cars in general.

Little is necessary other than a clear cut showing internal constructions. It would be well to know that the most valuable information would be on such construction as was not adopted as standard, as a good mechanic at this stage is well acquainted with the present equipments though there is always something new to one that might be old to another. Such I am sure would meet with a success and be of help to many and could be extended from one thing to another until each shop would have a volume of information dealing on everything in general.

Philadelphia, Pa. J. M. WHITE.

Discusses Timing Further

Editor THE AUTOMOBILE:—Thanking you for your kindness in answering my questions upon motor design in your issue of December 19, 1912, I must still beg leave to differ with you upon some of your answers:

1—It was the rotary valve of 1907 of Mr. Duryea's to which I had illustration of his later designs.

2—I have never seen a crankshaft that did not have the central cranks upon the same side, and never seen an illustration of but one that did not have them that way, and that was used in one of the first models of the Peerless and was made with 1 and 3 up and 2 and 4 down. I do not know what the timing for that was, but it must have been 1, 2, 3, 4, or it might have been 1, 4, 2, 3. I had supposed that the 1, 2, 4, 3 timing had become settled practice until reading the article upon the new Hudson machine in a recent number of THE AUTOMOBILE. I learned it had been changed to 1, 3, 4, 2 timing, which could also be correctly stated as 2, 1, 3, 4 timing, and was curious to know why.

4—With the flywheel in front, the cranks would be working between the resistance due to the load upon the rear end and the inertia of the flywheel upon the other, since, even if the flywheel is running at speed, the cranks under the influence of the kick of the cylinders are moving or tending to move with a greater angular velocity than the flywheel and if you will hold a shaft fast at both ends and apply a twisting effort to the center it will require a much greater effort to attain a given twist than it will by holding fast one end of the same shaft and leaving the other free. The Daimler vibration damper is in effect a flywheel with a slipping rim; why it would be allowed to slip, I do not know, unless they figure on allowing the cranks to spring and for the slipping rim to catch it, when it is springing back. Several engines I know of with the flywheel in front construction, the Maxwell in particular is a very smooth-running engine, but that any of its smoothness was due to the flywheel in front construction, I don't know that they ever claimed.

6—A S. O. Company wagon driver once told me that they figured on losing 5 gallons of gasoline a day per wagon from evaporation. All gas tanks not under air pressure have a breathing hole, and it is quite probable that some big tanks upon roadsters lose 1 quart or more a day from evaporation, an appreciable amount enough in the life of the car to more than pay for the cost of covering it. This point seems to ge given more attention upon the other side judging from illustrations of the Olympia and Paris shows. The only exposed tanks shown there were at the rear of the chassis partly under the tonneau and under pressure.

7—Have you any tables showing the coefficient of friction for smooth iron driving wheels (for tractors) and the ground or road and that for cleated drivers, same weight?

Mentone, Cal. JOHN LEFLER.

—7—THE AUTOMOBILE has no comparative figures on smooth and cleated tractor driving wheels as far as coefficient of fric-

tion goes. Weight for weight it would hardly appear that the increased tractive effort would compensate for the greater effort consumed in the drive.

Points on Multiple Series

Editor THE AUTOMOBILE:—I note in the questions and answer department of THE AUTOMOBILE in the January 16 issue where you answer a subscriber's query about why dry cells are better (more mileage) connected in multiple series than being in a single series. You are correct so far as you go, but I believe there are other features to this question which are still unanswered.

There are several sides to this idea why there is greater mileage per cell when connected in multiple-series than where a single series is used. To illustrate, a single series of cells, we will say, will ignite a car for 500 miles connected as in Fig. 1A. Now if we make a multiple-series connection as at B, using twelve cells instead of six as at A, instead of getting the even 1,000 miles we will easily get 1,100 miles. Now if we further increase the series in this multiple connection, as at C, we can still further increase the mileage per cell, say, about 1,700 miles.

There are several reasons for this; the main one, however, is that you are able to drain out the battery more completely. Take, for instance, one of the cells at A; after it is exhausted for ignition purposes and measure the amperes and it will still give 2 or more amperes, which is insufficient to energize the coil, but if there are two series of cells, as in B, you double the cells on the coil and have, hence, double the amperage output. This keeps the car going quite a while longer. This same idea is still further carried out with connections, as at C.

Another idea which favors multiple connection, as at B and C, is that there is a much lower discharge rate. Take, for instance C, where the rate of discharge per cell is only one-third what it is for A. A dry battery is by nature an open circuit battery and has to have time to recuperate between periods of service; therefore, if the rate of discharge is lower, it has a proportionately better chance to recuperate. Therefore the total mileage or total output per cell is increased when multiple-series are used instead of single series.

Woodsfield, O. J. K. MERCER.

Horsepower Difference Explained

Editor THE AUTOMOBILE:—Will you kindly explain the rating of the different makes of cars in your New York show issue:

	Horsepower	Cylinders	Cubic Inches
Ford Model T, 4 cyl., rated at....	22.50	3.75 by 4.00	176.7
Hupmobile C, 4 cyl., rated at.....	16.90	3.25 by 3.38	112.0
Lambert Buckeye, 40-4, rated at..	16.90	3.25 by 5.25	174.2
Oakland 35, 4-cyl., rated at.....	19.90	3.50 by 5.00	192.4

I do not understand how they can figure the horsepower in the case of the Ford with 176.7 piston displacement cubic inches 22.50 horsepower, and the Oakland with 192.4 piston displacement only 22.50 horsepower.

Is the Ford motor superior to other motors according to size? If so, why?

Cotesfield, Neb. H. BLANCHARD.

—These horsepowers are all figured out by the S. A. E. formula, $\frac{D^2N}{2.5}$. Where D is the bore, N the number of cylinders and 2.5 a constant adopted by the S. A. E. This method of rating is not accurate and does not show the true horsepower developed by any motor. It furnishes a basis of comparison, however, and is used for that reason. This does not show superiority in any motor. It is purely a mathematical formula. Recently there has been more or less agitation among manufacturers, engineers and designers regarding the value of the S. A. E. rating which promises some interesting discussions.

Depends Largely on Leakage

Editor THE AUTOMOBILE:—Please advise through your Letters Answered and Discussed what pressure can be obtained from a compressor with 3 inches bore and 3 inches stroke. Rings and cylinders are in fine condition and compressor space is practically nothing. Should it be driven at a speed over 200 revolutions per minute?

Prattsburgh, N. Y. H. C. MORGAN.

—With good fits at the rings you should be able to get a pressure of 120 pounds to the square inch easily. This is figuring that the machine was originally designed for a compressor and was not a motor. If the compressor is water-cooled, you should get from 15 to 20 per cent. more than this. It would not be wise to drive this over 200 revolutions per minute if it is air cooled.

Suggest Two Flywheels for Motor

Editor THE AUTOMOBILE:—Why would it not be a good idea to put two balance or flywheels (one on each end) on the shaft of a motor? Make each one-half as heavy as at present, but not reduce the diameter. Make them one-half as thick.

It always looked to me that a heavy wheel on the end of a shaft when the explosion takes place, exerts an awful tendency to twist or yank the shaft. With one on each end, would it not minimize that twist, and at the same time steady the motor by equalizing the weight and thereby reducing the vibration?

Providence, R. I. J. J. COOPER.

—This idea has been worked out successfully before now and is in actual use at the present time on the Daimler-Knight motor. The distortion of the shaft at the time of rapid acceleration is cut down considerably by this means as the twist is taken up through both halves of the shaft instead of through one end alone.

Testing Oil at Home

Editor THE AUTOMOBILE:—Please inform me if there is a way that lubricating oil may be tested at garages for specific gravity, viscosity, flash and fire test.

Greenwood, S. C. C. M. OUZTS.

—The various tests on oil may be made at home, although the same accuracy as would be secured with a complete laboratory cannot be expected. There are five tests which are generally made on lubricating oil and all of them except one can be made within very close limits at the garage. The five are the specific gravity, flash, fire, cold and viscosity. The last named, the viscosity test, is the only one that cannot be made to great satisfaction without any other tools but a bunsen burner and a porcelain dish along with a few other equally common utensils. Taking these tests in order, the first to be considered is the

1—Specific Gravity: Place the oil in a long cylindrical vessel and with a hydrometer read off the specific gravity of the oil. The hydrometer is an instrument which is weighted at one end so that it will float in an upright position. It is made of glass

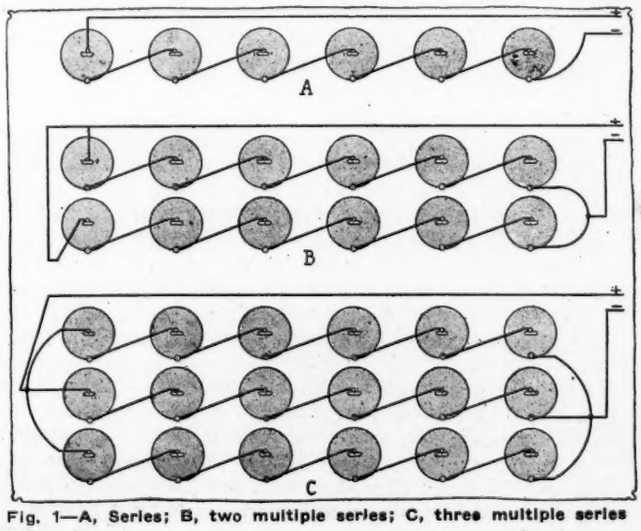

Fig. 1—A, Series; B, two multiple series; C, three multiple series

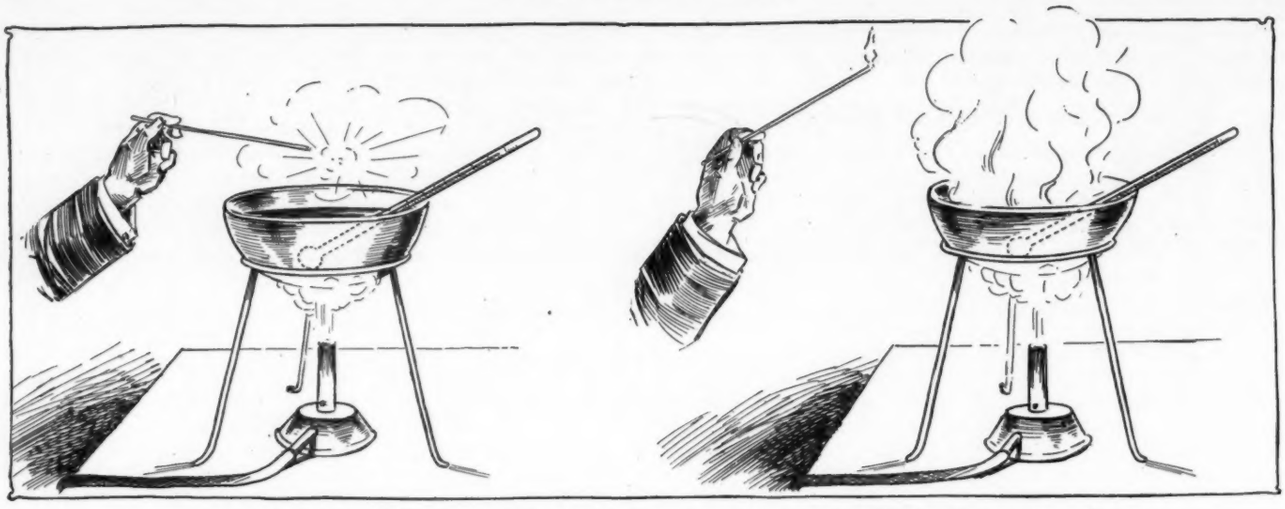

Fig. 2—Making flash tests and fire test on oil with porcelain dish, Bunsen burner and wax taper

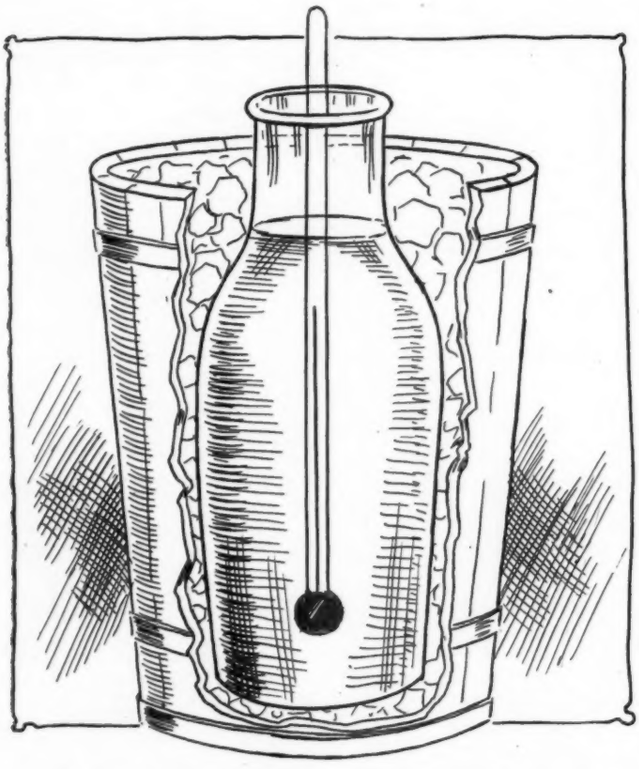

Fig. 3—Making the cold test on oil in freezing apparatus

and on it are imprinted the specific gravities. The level of the liquid furnishes the point at which the reading is taken. If it desired to convert this over to the Beaumé scale, a conversion table will be found in any mechanical or chemical handbook.

2—The flash point of an oil is that Fahrenheit temperature at which it will give off an inflammable vapor. This differs from the fire point in that the vapor need only flash and does not burn steadily. It may be found in the garage in the manner shown in Fig. 2. First secure a burner and a porcelain dish. Place a thermometer which registers between 300 and 475 degrees Fahrenheit in the porcelain dish and pour in a quantity of the oil to be tested. When the temperature of the oil has risen to 300, try the taper over the dish every 10 seconds, watching the thermometer carefully. At last there will be a point where the vapor above the oil will ignite with a flash. This is the flash point of the oil. Note the temperature at this point.

3—Fire Test: Continue the operation described under the flash test until the vapor above the oil ignites and burns steadily. The temperature reading at this point will give you the fire point. The fire point is always very close to 50 degrees above the flash point. With this knowledge it is easy to begin the tests at very close to the correct temperature.

4—Cold Test: This is sometimes called the cloud test. When the temperature of an oil drops to a certain temperature, the oil becomes cloudy and will not pour readily. The point at which the oil refuses to pour is the cold point. It can be secured by the method shown in Fig. 3. A bottle containing the oil is placed in a larger vessel packed in salt and ice in the same manner as in an ice cream freezer. A low-reading thermometer is placed in the bottle containing the oil and the temperature of clouding noted. At this point the oil will be found to have reached its cold point. The cold point may be expected somewhere in the neighborhood of 20 degrees above zero.

5—Viscosity: This is the rate of flow of the oil through an orifice. The actual viscosity must be taken through a Seybold or other viscosity meter. A comparative test may be made as shown in Fig. 4 by taking an oil of known viscosity and the oil of which the viscosity remains to be known. The funnel is closed in some manner so that a small opening is left. The opening in each should be the same. If necessary one oil can be run through and the drops timed with a stop watch and then the other run through the same opening. The temperature of both oils must necessarily be the same if the viscosity is to be tested anywhere nearly correctly.

Wants to Know Correct Tires

Editor THE AUTOMOBILE:—I have a Jackson car. Its weight is 3,100 pounds. I would like to know what size tires would be best. The ones I have on it are 34 by 4, and they blow out very often. If they are too small for the weight of the car, please tell me what size to use.

Luanna, Fla. HENDERSON BROS.

—The correct size tire to use with your car would be 35 by 4.5 inches. Any standard make of this size will go on your car and will fit the 34 by 4-inch rim.

Charging Magneto with Dry Cells

Editor THE AUTOMOBILE:—Can an ordinary low-tension, alternating-current magneto be charged with a set of dry cells, in the absence of a storage battery or direct current? If practical, how many dry cells of the ordinary ignition type would be necessary where the original magneto output is 5 amperes at 12 volts, normal speed.

Kindly give a diagram showing the correct way of connecting up for this purpose.

Maynard, Minn. O. HAWKINSON.

—This would be highly impractical and very costly. It would be a much cheaper plan to send the instrument to the manufac-

turer who would only charge about $2.50 to do the work. The only way it is possible to charge the magnet with a direct-current supply of any kind available would be to have a special winding made. The magnet must have a certain number of lines of force and the only way they can be properly secured without going to a considerable waste of time and money is by an electro-magnet.

Converting a Touring Body

Editor THE AUTOMOBILE:—I am driving a 1910 Cadillac touring car and wish to make a roadster out of it.

Can you tell me where I could find a firm making bodies that would be suitable?

Is there any in Indjana?

Salem, Ind. REED PHILLIPS.

—Either the La Porte Carriage Company, La Porte, Ind.; Robbins & Company, Eleventh and Canal streets, Indianapolis, Ind., or the Union City Body Company, Union City, Ind., should be able to handle the work for you.

Digest of Leading Foreign Journals

(*Continued from page* 352.)

raised to great heights. Another shortcoming of the positive pump is that it cannot handle small amounts of water. As the minimum speed of the motor is limited to about 300 revolutions and the capacity of the pump changes positively with the number of revolutions, there is always a minimum capacity below which the pump cannot work, and this minimum comes higher the larger the maximum performance is chosen. With the centrifugal pump the minimum falls below practical working requirements.

Fig. 5 shows the great change in working range of the positive pump which is secured when the gear ratio is made 1 to 2. The reach of the equipment is greatly increased and the minimum capacity is reduced—very desirably—from 525 liters to 260 liters per minute, but this is accomplished only by sacrificing the maximum capacity, reducing it from 1500 liters, on direct drive, to 900 liters. Only an optional gear ratio would give the adaptability to all working conditions, and the operation of a gear box in fire-fighting would represent a considerable complication.

The curves also permit an estimate of how the different equipments will behave in two frequently occurring instances. When the pressure channel is obstructed, as by the freezing or clogging of a hose or nozzle, the pump pressure rises while the capacity drops to zero. The centrifugal pump in this case partly unloads the motor but not sufficiently to make it run wild. If the motor was working under full fuel charges, the pump continues to work under maximum back-pressure, while the motor, according to Fig. 1, goes up to about 1300 r.p.m. Only the high pressure to which the hose is subjected consequently requires immediate attention. The positive pump under the same condition comes to a stop, since the minimum capacity is limited.

The other possibility referred to is that a hose may burst. The resistance in the centrifugal pump is then increased, since it depends upon capacity, and the pump drops automatically to a reduced speed; according to Fig. 1 to about 900 revolutions of the motor. The Pittler pump in this case takes most of the load off the motor, and the latter speeds up rapidly.

As may be seen from the foregoing a great need exists for diagrams from which it may be determined in advance what combination of motor and pump should be selected for a given set of local conditions in fire-fighting.—From *Zeitschrift des Mitteleuropäischen Motorwagen Vereins;* December 15.

Engineers' Forum—Front Wheel Design

(*Continued from page* 353.)

friction between rubber tires and the road surface does not exceed .6. In this case the lateral pressure on the wheel could not exceed .6 of the weight resting on that wheel. At this point the wheel would commence to slide sideways. I am confident that this pressure is never reached in the front wheel. I have carefully observed racing cars taking turns fast enough to slide sideways and have noticed that the rear wheels slide but the front ones do not. The reason for this is quite clear. **When the car begins to turn the greater proportion of the weight is thrown on the front wheels.** Thus the friction between the rear wheels and the road is decreased and they begin to slide.

The wheel, Fig. 1, is that put out by one of the prominent axle manufacturers. It is for cars weighing 3,000 pounds.

By reference to the accompanying table we find that a car of this weight making a turn of 100 feet radius at 20 miles per hour will have a centrifugal force of 807 pounds. If we assume that one-third of the entire weight of the car rests on the wheel, then the weight on the wheel will be 1,000 pounds, and the lateral pressure will be 269 pounds. By laying out these forces graphically as in A, Fig. 2, we find that F is equal to 1,035 pounds. The distance L in this case is 4.66 inches, and B is 3.5 inches. Substituting these values in the formula $\frac{1{,}035 \times 4.66}{3.5} = 1360$, or 1,360 pounds load on the outer bearing. The load on the inner bearing will be 1,360 + 1,000 = 2,360 pounds radial load and 269 thrust.

The bearings in this wheel are numbers 306 and 308 ball bearings. One manufacturer gives a rating for these sizes of 1,320 pounds and 1,980 pounds respectively. Thus it would seem that the inner bearing was overloaded. This overload, however, would be easily taken care of by the overload capacity of the bearings.—F. C. SHEEHY.

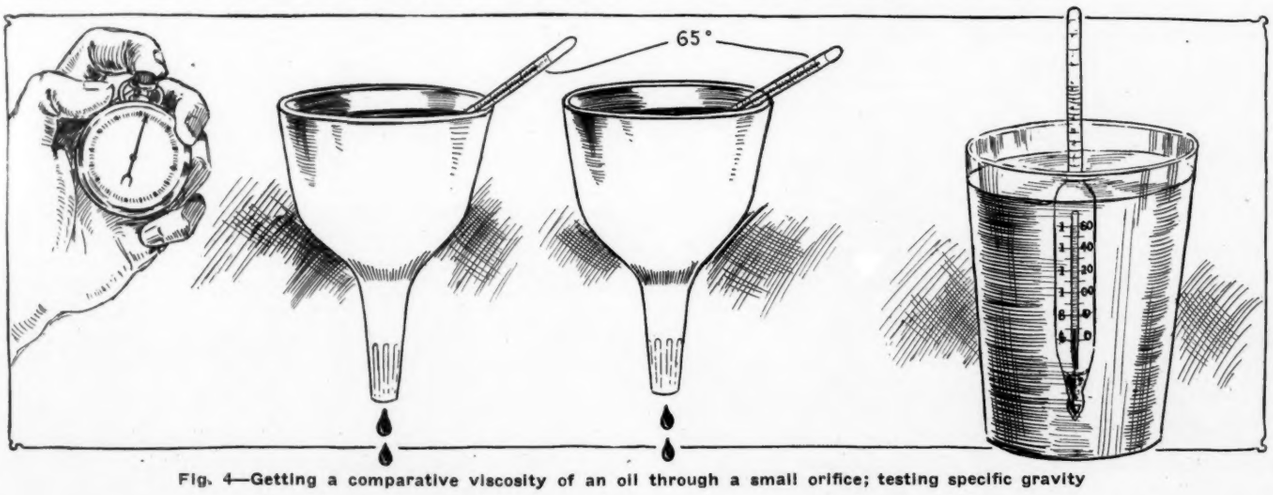

Fig. 4—Getting a comparative viscosity of an oil through a small orifice; testing specific gravity

Fig. 1—Automatic temperature compensator and new shaft of Stewart speedometer

1913 Speedometers

Refinement of Details Makes For Exactness and Strength

IN the speedometer field practically no radical change has been made during 1912 and the 1913 exhibits resemble those of last year to a great extent. Most of the companies show the same models which they exhibited last year and the only differences in the constructions are of a nature of refinement and general strengthening of the mechanisms, making the latter more exact and more capable of withstanding shocks and vibration. In several cases improvements of a gratifying nature have been made in the swivel joints and in the flexible driving shafts. A new compensator which balances the expansion and contraction of the indicator control spring in the Stewart & Clark instrument deserves special mention as a simple and apparently efficient means for obtaining greater exactitude of the instrument under all conditions. Below short descriptions of the speedometers shown at the National Show are given, special attention being paid to the changes which have been made.

The maker of the Jones speedometer has made a new step in speedometer construction by introducing in one model a recorder mechanism which not only indicates the traveling speed of the car, but shows at what speed it moved every minute during half a day.

Stewart Has Automatic Compensator

Stewart speedometer, made by the Stewart-Warner Speedometer Corporation, Chicago, Ill., comprises two series of models, namely, magnetic and centrifugal. In the centrifugal type a governor by its deflection due to the rotation of the shaft carrying it moves an indicator hand which shows the speed of the car in miles per hour on a circular scale calibrated on the silver faced dial. In the magnetic type a vertical cylinder, which is dragged along by the attraction of the rotating magnet, indicates the speed. The disk or cylinder is not influenced by a change of temperature such as may be due to a warmer or colder climate, but the hair spring S which returns the disk to the zero position when the magnet-carrying shaft is at rest is subject to expansion and contraction in heat and cold respectively. To compensate for this change a compensator is usel consisting of a plate on which a laminated strip C of steel and brass is mounted. This combination of materials is very sensitive to a change of temperature and as it expands or contracts acts on a sector C1 and pinion lengthening the hair spring in warm weather or shortening it in cold, thereby counteracting for the expansion or contracting of the spring itself. The centrifugal types are likewise equipped with a compensator acting on the hair spring which returns the hand to zero when the shaft ceases rotating. The company makes 16 models for automobile speed indication, as follows: Models A, A2, A1 and A3 are known as Tachometers and are distinguished by the use of a hand operated compensator for increasing or decreasing the indication for given speed of the car. The latter two models are fitted with Seth-Thomas 8-day clocks. Models B, B2, B1, B3 and B4 are known as Speedometers and all of them excepting the first two are fitted with 8-day clocks; the entire series B is also equipped with a gradiator consisting of a cylindrical disk rotatable about a horizontal axis and operating on what the company calls a pendulum principle, that is the center of gravity lies at that point of the cylinder periphery which is 90 degrees below the point marked 0 degree. Models C, C2, C1, C3, E and 26 are lower priced products, the last named model being the only example of a centrifugal speedometer on this company's line. The principal improvements for this year are the above described automatic compensator and all steel flexible shaft; besides a steel dropped forged swivel joint is used. The corporation continues its Warner Auto-Meter without any change. This meter is of the magnetic type in which a magnet mounted on the rotating shaft which is driven by the flexible shaft, exerts a torque through magnetic attraction on a thin cylindrical metal disk surrounding it. A spring attached to this disk tends to hold it in the position when the zero mark is in alignment with the indicator point on the dial of the meter. As the magnet rotates it exerts a pull on this disk and tends to rotate it against the tension of the spring, the pull having a definite proportion to the speed of rotation of a magnet so that the torque may be used as a means for measuring this speed.

Jones Recording Speedometer New

Jones speedometers are continued from last year. No changes have been made in the models which are but carried over, but two new models are now being offered, the speedometer model 40 and the recording speedometer model 34/39. The latter combines all features of Jones speedometer with the construction of the recorder which was brought out by the Jones company a year ago and which records exactly the speed made by a car during the day and for how long each speed was kept up. The record is made on a wax-covered sheet by a metal point. The wax sheet turns once in 12 hours, being carried on a clock-driven pin, and the metal point which makes the record is moved up and down by a cam when the car moves. Consequently a zigzag line is produced, the pitch of which is an indication of the car speed, being determined by the travel of the pencil—which is proportional to that of the car—and the travel of the sheet proportional to the time during which the car moves. The sheet is concealed behind a glass plate held in a rim which locks on the body of the casing. The speedometer mechanism is of the centrifugal type and the dial is adapted to indicate speed up to 60 miles an hour; a 100,000-mile odometer and a 100-mile trip meter are also provided. The model 40 speedometer is built along the same lines as the other speedometer models, without the recorder mechanism, and is equipped with a 70-mile and hour dial and 100,000-mile and 100-mile odometer and tripmeter, respectively.

Six speedometer models are the 1913 product of the Hoffecker

Company, of Boston, Mass. Two of these models, K and L, include speedometer season meter and daily tripmeter only, while the remaining four are equipped with 8-day Waltham clocks. The operating principle of this speedometer is as follows: A three-disk governor rotates around the speedometer shaft, being held close to it by a spring which is wound around that shaft. When the shaft rotates the convex disks fly away from the axis of rotation and in doing so press upon a curved spring, one end of which is secured to the back of the indicator dial and the other end to a lever which transmits the deflection of the spring to the indicating needle on the face of the dial. Gears actuated by pinions on the governor shaft drive the odometer or season meter, which has a 10,000-mile capacity in the smaller types and a 100,000-mile capacity in the larger models. The daily tripmeter mechanism actuates a hand mounted on the central spindle, which also carries the speedometer hand. The changes in the 1913 models include the use of an adjustable shaft which permits setting the arm containing the swivel joint at any angle and therefore makes the mounting of the instrument easy on any car. The pleasure car meters of the model L type are fitted with a gradiator, so called, for indicating the incline of an upgrade over which the car travels; this gradiator is furnished at option, taking the place of the 100-mile daily indicator. In the truck meter the swivel joint has been done away with, having been supplanted by a single pair of pinions, one of which is mounted on the cross-shaft actuating the governor shaft and the other at the end of the driveshaft, to which the flexible shaft is attached. The latter is made of highly elastic steel, wound closely and giving a stronger and more elastic means for driving the meter than the ordinary shaft. At the same time vibration transmitted by the shaft is avoided at least to a considerable extent.

Dean Brings Out Centrifugal Type

A newcomer in the line of speedometer manufacturers, the Dean Electric Company, Elyria, O., maker of automobile horns, has exhibited its speedometers for the first time at the Garden and Palace. This instrument is of the centrifugal class, four steel balls being so connected to a spider that when the latter is rotated the balls are deflected from the axis and rotation and lift a cup which is directly connected to the hand on the dial. The flexible shaft enters a key in the spider shaft, so that no gears are required between them. The odometer and tripmeter mechanisms are driven by worm gears, and the latter meter may be reset to zero by means of a button in the side of the casing. The face of the meter is oxidized black with nickel or silver scales.

The Veeder Manufacturing Company, Hartford, Conn., has made practically no change in its product. The hubodometer mechanism is the same as last year, and the only difference is in the front cover which screws on the casing of the mechanism proper instead of being riveted to it as last year. After being thus attached the cover is pinned to the casing to prevent unscrewing of the former. The other instruments made by this company, including the odometer and tripmeter as well as the tachodometer, are continued without change.

The Standard Thermometer Company, Boston, Mass., continues its line of speedometers, which are of the centrifugal type. The changes which have been made since last year in these models are in the nature of refinement and increased strength of parts. By this practice the use of the meter is made practicable for commercial vehicles on which there is a great deal of vibrations and shocks that must not disturb the workings of the speed indicator. As the swivel joint is one of the placed subjected to most strains, the Standard company uses now gears which are made of nickel steel. Furthermore, to insure the good working of the device a practically unbreakable kind of flexible shaft is used for driving the meter. This casing is nickel-plated and looks as substantial as it is constructed.

The Corbin Screw Corporation, New Britain, Conn., which has taken over during 1912 the Brown speedometer, continues the latter without any changes. It will be remembered that this speedometer is of the centrifugal type and driven by a flexible shaft, the governor shaft carrying a gear which actuates the gear trains of the odometer and tripmeter mechanisms. The Corbin-Brown speedometer is made in two types, namely, as a simple speedometer and in combination with a clock.

Speedograph for Trucks Continued

One of the instruments in this class and which was shown at the Garden is the Speedograph made by the Recording Speedometer Company of Newark, N. J., which serves for recording the actual time during which an automobile moved during a day and the speed at which it moved. The instrument comprises an inclosed mechanism, the casing of which carries on its top cover the indicator mechanism. The latter consists of two spools, one of which is rotated by a clock incased in the housing and the other carries a paper tape which is wound up from it to the spool driven by the clock. A vertical shaft fixed to the top of the casing carries a pencil contacting with the paper leaving the spool from which it travels to the other; the pencil is held against the paper by a spring. A flexible drive entering at the bottom of the casing actuates a vertical worm shaft meshing at its top with a worm gear turning about a horizontal axis and carrying a heart-shaped cam which alternately lifts and drops a follower, the latter carrying in turn the above mentioned pencil. The worm mechanism being actuated when the car moves causes the pencil to be reciprocated vertically through the height of one inch at a speed proportional to the traveling speed of the car. At the same time the clockwork draws the paper tape from one spool to the other at a uniform rate of speed during the day so that as the pencil reciprocates relatively fast a series of steep lines is made by it, while a lower travel of the car is indicated by a lesser incline of the line made by the pencil. When the car is at rest the pencil is stationary and describes the horizontal line on the tape. Excepting a slightly heavier construction this device has not been changed since last year.

The American Taximeter Company exhibited Jones and Popp taximeters in which a few changes have been made since last year. A star-driven collar is used instead of the gear drive of last year, and it is claimed that this construction makes the whole mechanism stronger than before. A foolproof casing is provided by the use of an overlapping front cover between which and the casing strips of metal are inserted to prevent tampering with the indicating mechanism.

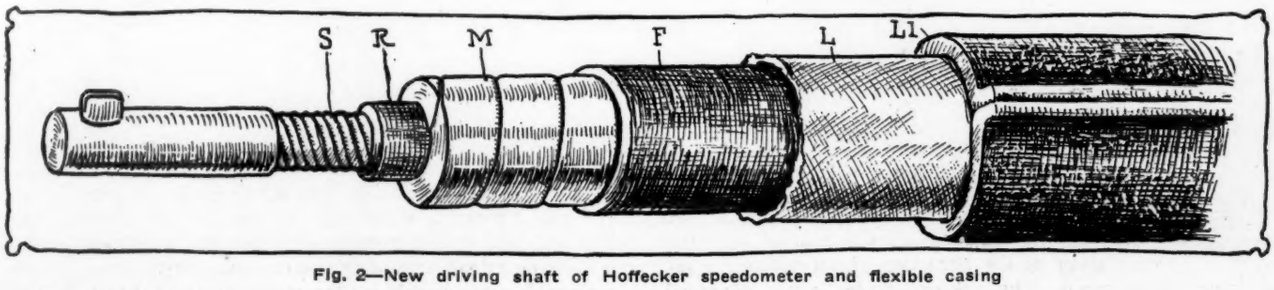

Fig. 2—New driving shaft of Hoffecker speedometer and flexible casing

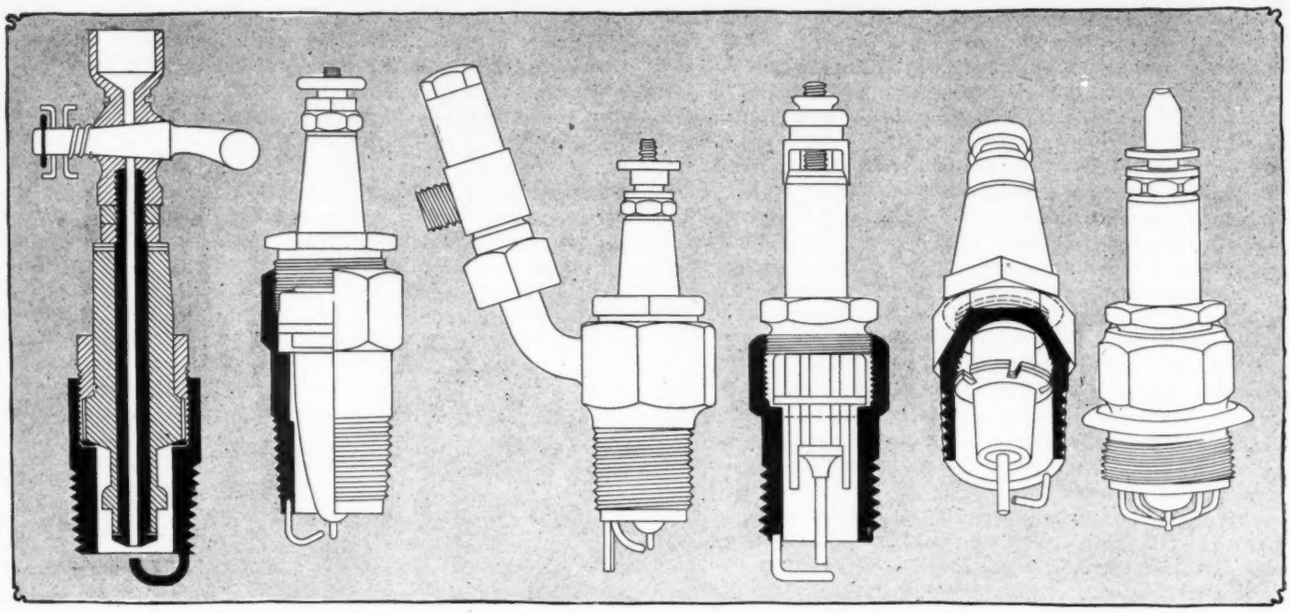

Fig. 1—Heco priming. Fig. 2—AC Ford plug. Fig. 3—AC priming type. Fig. 4—MacKae Blitz plug. Fig. 5—Wright. Fig. 6—V-Ray

Many New Spark Plugs This Year

Priming Plugs and Mica-Porcelain Designs Galore

FOR 1913 the American automobilist and automobile manufacturer are being offered a selection of spark-plugs greater in number and variety than ever before. As for the first, the plugs here described include hardly any except what was seen at the New York shows, whereas the variety is furnished by the use of all types, designs and materials. There are long and short, thin and stout plugs; plugs with steel and brass bushings, mica or porcelain insulation, or both; copper, asbestos or combination copper-asbestos packings; ordinary plugs, heavy-duty types, priming plugs and visible spark designs.

Several noticeable tendencies which are illustrated by the following review of the situation are: The trend toward a mechanically strong, if not unbreakable plug; the use of an absolutely insulating covering for the electrode, such as the combination of porcelain and mica offers; features permitting of quick inspection and removal of the plug, and, finally, priming plugs which combine the work of spark-plugs with that of cups for squirting gasoline or air into the cylinders.

Red Head Priming and Combination

The Emil Grossman Company, New York City, has added three types of plug to its line of regular Red Head designs during the past year. These types are the Platinum Point, the Combination, Fig. 11, and the Priming plugs, the latter being shown in Fig. 12. The first is the highest priced plug of the line and while its shell and insulation are designed much the same as the regular plug, it differs from the latter in the shape and nature of the electrodes. The positive one is plated, from the point to .03 inch above it, with a layer of platinum .03 inch thick; the negative one is bent horizontally from the shell toward the center, making the entire plug more compact. The combination plug uses both mica and porcelain for protecting the positive electrode. A mica cover is wrapped around the metal and, in addition to this, the section of the electrode which is inside the shell is covered with porcelain, thereby making use of both the great heat-resistance of the latter and of the electrical strength of mica. A slight contraction of the shell above the point supplies a priming combustion chamber. The priming plug is different from all these types, due to the use of a brass priming cock and the adaptation of the porcelain to make the use of the cock efficient. The latter is so designed that the fuel squirted into it flows upon the porcelain insulation to the plug point where it is vaporized or at any rate is in readiness for combustion. The insulation used in this plug is of uniform porcelain.

Bosch Changes Electrode Shape

The spark plugs of the Bosch Magneto Company, New York City, are continued without essential changes, the only development being the new form of negative electrodes. The latter are three in number for every plug and are bent inward from the shell periphery, being shaped of heavy wire and with flattened ends; this gives a wide sector-shaped

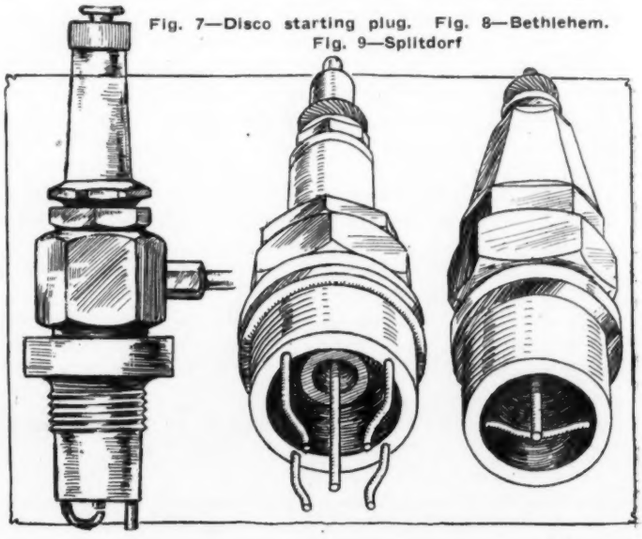

Fig. 7—Disco starting plug. Fig. 8—Bethlehem. Fig. 9—Splitdorf

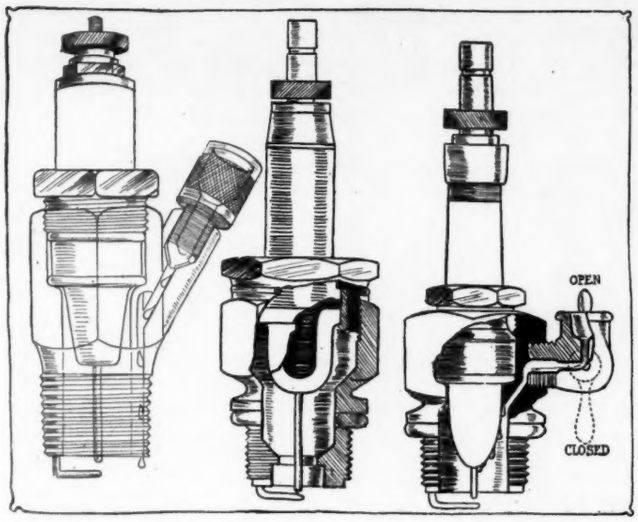

Fig. 10—Champion priming. Fig. 11—Red Head combination. Fig. 12—Red Head priming

sparking line, with all points equidistant from the central electrode. The negative electrodes are built somewhat heavier than last year. As for the positive electrode, this is a stout nickel rod welded into the steel terminal to give effective transfer of the heat from the former to the latter. The insulation is of steatite, a material adopted by the company as specially suited for its needs. The insulation is packed at its upper shoulder against the bushing by a washer of soft metal, which is compressed between steatite and metal; the lower shoulder is packed by a copper-asbestos ring.

Blake Plug's Many New Features

A spark-plug not exhibited in New York before the recent show which is suitable for use as a priming cup, without containing a cock used in other plugs for this purpose, is made by the Blake Spark-Plug Company, Boston, Mass. On this plug, the lower edge of the shell, Fig. 13, is formed with two diametrically opposed taper surfaces sloping in the same direction as the thread of the plug. These surfaces afford a tight engagement with projections formed on the bushing which holds the nut containing the porcelain. The bushing itself, Fig. 14, is ground to a taper fit against the inner face of the shell and is formed with a .06-inch shoulder at its upper end to insure gas-tightness. Attached to this shoulder is a wooden handle which permits of turning the bushing so as to engage or disengage the tapered projection at its bottom portion with the surfaces on the shell. If the turning of the handle is continued after the faces are disengaged, the plug shell is unscrewed from the cylinder. The electrode design is also original. The positive electrode extends but .04 inch below the lower edge of the bushing and the negative electrode is formed by a flat arch connecting the opposite points of the brass bushing and affording a wavering spark. The insulation is of porcelain down as far as .5 inch above the lower edge of the bushing.

Herz Plug Continued Unchanged

Herz & Company, New York City, are continuing their line of spark-plugs without any alteration whatsoever. This plug is distinguished by a funnel-shaped, positive electrode, from which four projections extend toward the surrounding shell, giving four sparks every time the secondary circuit is passed through the plug.

Mosler Junior Plug an Addition

A. R. Mosler & Company, New York City, continue their former spark-plug types and besides having developed, during 1912, a number of types specially adapted for certain makes of car, they have brought out the Junior plug in which the asbestos packing and wicking has been done away with, being supplanted by copper packing. Furthermore, a steel bushing is used instead of the brass part which constituted part of the former standard designs. The special plugs made by the Mosler company are designed for the following motors: Ford, Overland, R. C. H., Alco, Chalmers, Fiat, Hudson, Locomobile, White and Knight.

Bethlehem Five-Point Plug

A spark-plug having one positive and four negative electrodes is made under the name Bethlehem by the Silvex Company, New York City. On this plug, Fig. 8, the central electrode projects .5 inch below the edge of the shell, being surrounded by four negative points which are secured to the shell and are bent inward, offering four spark-gaps, so that there is always a possibility for firing the mixture even if one or two gaps are useless, due to deposits; the latter are burned in time by the explosions started from the other points. The Bethlehem plug is forged from cold-drawn Bethlehem steel and the porcelain is of German material which does not crack in any heat produced by a motor.

Heinze Priming Plugs

Another company making priming plugs is the Heinze Electric Company, Lowell, Mass., manufacturer of the Heco plug, Fig. 17. The ordinary type of plug made by this company contains either mica or porcelain as insulating material. The appearance of the plug is distinctive by reason of the peculiarly formed electrodes. The positive one is a straight point as in other plugs, while the negative electrode is formed by a straight, horizontal, diametrical bridge, the spark jumping downward through a gap of .03 inch. The priming plug known as Heco is shown in Fig. 1 and is of the mica-insulation type. The

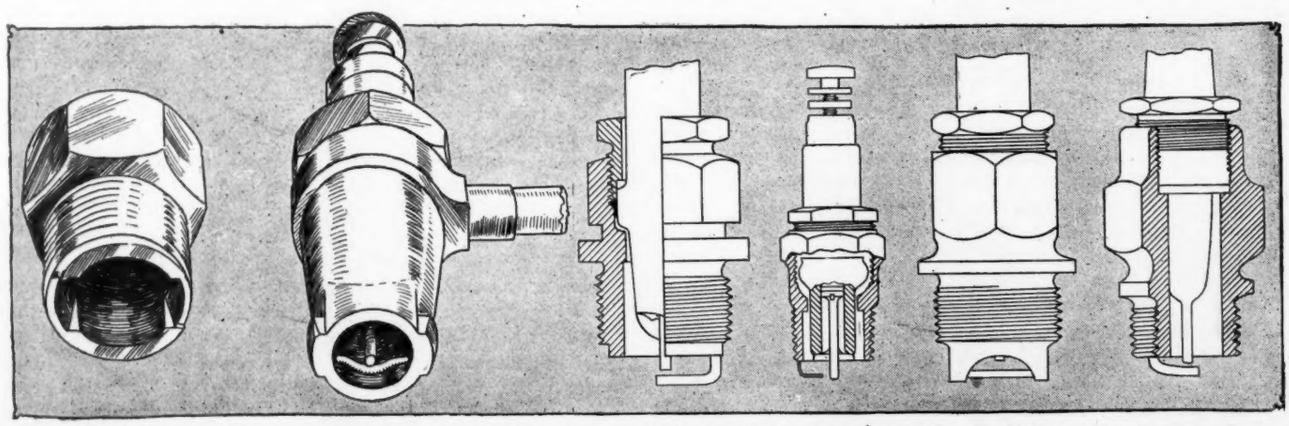

Fig. 13—Blake plug shell. Fig. 14—Blake body. Fig. 15—H. M. S. Fig. 16—Mezger Soot-Proof. Fig. 17—Heinze. Fig. 18—Bull's Eye

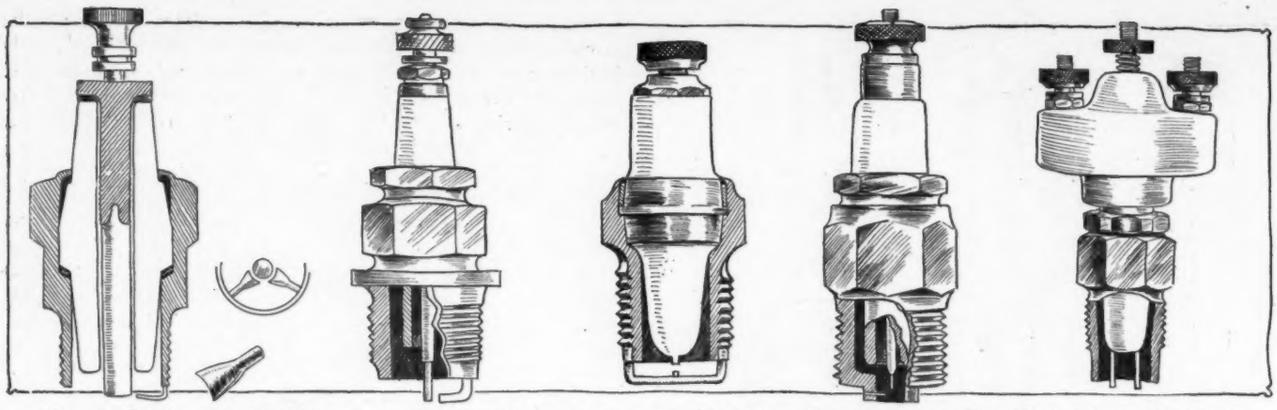

Fig. 19—Bosch. Fig. 20—Miller plug. Fig. 21—J-D heavy duty. Fig. 22—Janney-Steinmetz plug. Fig. 23—J-D two-point plug

positive electrode extends right through the plug as far up as the cock which when turned up forms a priming channel permitting of squirting fuel into the cylinder. A brass nut and washer between insulation and cock form the part to which the wire led from the magneto is attached. The shell carries a wire curved into a semi-circle and forming the negative electrode. A copper washer is fitted to the bottom of the priming channel which at the same time forms the positive electrode. Special priming plugs for Model T Ford motors are being made by this company.

V-Ray Plug Has Some Improvements

The V-Ray spark-plug, Fig. 6, made by the V-Ray Company, Marshalltown, Ia., differs from other plugs principally by the formation of the insulation. The latter issues from the shell into the cylinder without any clearance in which deposits of carbon and oil may form; the insulation is formed of lava for the lower part and mica for the top. The electrodes are of Bokers Meteor wire and four negative electrodes are arranged around a positive one. The plug has a wide shoulder, calling for the use of a packing to insure perfect tightness.

Kingston Plugs Unchanged

The Kokomo Electric Company, Kokomo, Ind., continues its line of Kingston spark-plugs without a change. These plugs are made in three sizes and are formed with stout mica insulations and shells and electrodes of conventional design.

Monarch Plugs of Two Types

Two principles of design are used in the plugs shown by the Benford Manufacturing Company, Mount Vernon, N. Y. The porcelain types are made with insulations fashioned much like those used in the majority of plugs and the electrode design is also the common sort, consisting of a single point extending from the shell to the central electrode. The magneto plug, so called, uses mica for the insulation and the positive electrode is formed as a star giving eight sparking points.

Pittsfield Insulation of Porcelain

The Western Electric Company continues its spark-plugs with few changes. All plugs may now be obtained with porcelain insulation instead of mica, which was the universal equipment before. Furthermore, single or multiple sparking points may be obtained with any type of plug. There is also a combination plug, combining the use of porcelain and mica for the covering of positive electrode.

Splitdorf—New Form of Electrode

Two minor changes have been introduced by the Splitdorf Electrical Company, Newark, N. J., in its spark-plug line. The principal one is the new form of electrode used on the standard plug. This was formed last year as a point projecting horizontally from the shell toward the positive electrode, while now it is shaped as a bridge extending from two diametrically opposite points of the shell periphery toward the positive sparking point, being arched around it, so that more sparking positions become available. This results in a series of sparks reciprocating from one side to the other, a desirable practice according to many experts. Another refinement of the standard plug is the use of a combination terminal screw, Fig. 9, which permits the use of a Rajah, Hedstrom, wire or punched sheet metal terminal. Otherwise the line of plugs, which includes the Standard, Metric and Common Sense designs, has not been changed.

Mac-Kae Blitz Spark-Plug

The Randall-Faichney Company, Boston, Mass., maker of the Jericho horn, handles the Mac-Kae Blitz spark-plug which is made with a combination insulation, an inner coat of mica and an outer one of porcelain protecting the positive electrode. The mica is designed primarily for the purpose of electrical insulation, while the porcelain protects it against moisture and oil. Tightness between the shoulder of the porcelain and the shell and bushing is insured by a copper gasket. The electrodes are designed as seen in Fig. 4 and are platinum-iridium plated.

Two H M S Types of Plugs

The H M S plug, Fig. 15, of the Hartford Machine Screw Company, Hartford, Conn., is being made in two types this year, the former type having been continued with the only change being the use of a steel bushing instead of the brass bushing of 1912. The new model, like the old one, is a porcelain-insulated type, the porcelain being conical in shape, while in the old type it is formed in such a way as to justify the name of the plug, namely, petticoat type. The electrodes are conventional in form.

Best Plug Has Button Electrode

The Best Ignition Equipment Company, New York City, makes the same type of plug which it has manufactured during 1912. In this plug the end of the positive electrode is formed as a button which acts also as a condenser and from which the spark jumps to a ring-shaped attachment of the shell, which serves as negative electrode. A detail of the construction worthy of mention is a helical spring which presses a nut washer against a lock nut on the end of the positive terminal, whereby the wire from the magneto is held tightly in place.

Jeffery-Dewitt's Novelties

Among the three spark plugs made by the Jeffery-Dewitt Company, Detroit, Mich., are three new types of plug—the visible-spark, heavy-duty and two-point plugs. The first type, not shown here, has a small, glass-incased gap interposed in the circuit, between the terminal nut and the sparking end of the positive electrode, which shows a spark whenever the circuit is closed. When a plug misses the gap

shows no spark, thereby indicating the plug being foul. The heavy-duty plug is distinguished by the stout porcelain insulation making the plug, which otherwise is built along standard Jeffery-Dewitt lines, specially suitable for truck work. Finally, the two-point plug is adaptable for dual or double ignition, containing two positive electrodes which are connected to battery and magneto respectively. Depending on the system, either point may be used if dual ignition is the equipment, while with double ignition both electrodes operate, giving two sparks for every cylinder with but one set of plugs; the latter are made in standard threads and interchangeable with other spark plugs.

Bull's Eye Plugs Continued

A visible spark feature plug is manufactured by the G. C. Blickensderfer Manufacturing Company, Stamford, Conn., under the name of Bull's-Eye. This plug is distinguished by the specially shaped shell, and has two glass windows at two opposite points of the shell, behind which visible gaps are in place. By means of this construction a blue light is radiated from the plug whenever it is firing, while, if it is foul, the windows are dark, indicating which plug is missing.

AC Plugs Make Up Wide Line

The Champion Ignition Company, Flint, Mich., offers a variety of spark plugs for 1913, consisting of the former models and several new types. The special Ford plug, Fig. 2, consists of a conical porcelain insulation, a brass bushing and steel shell specially threaded to fit into a Ford Model T cylinder. The electrodes are of wire, the positive being straight and fitted into the insulation in a conventional manner, while the negative is bent as in Fig. 2. The priming plug has its shoulder formed with a priming attachment, bored with a fuel passage which connects with a vertical bore through the shell, ending in the vertical tube arranged close to the negative electrode. All A C plugs are insulated with porcelain.

Champion Priming Spark-Plug

A priming plug constitutes also the leader of the line of the Champion Spark Plug Company, Toledo, O., being shown in Fig. 10. This porcelain insulated plug is formed with an inclined lateral shoulder bored and threaded internally so as to permit of inserting in it the priming cup, the end of which is formed as a needle. When the cup is screwed tight in the seat the needle closes the passage for the fuel which otherwise drips down as shown. The porcelain is so formed as to provide a primary combustion chamber around it, which makes the ignition of the priming fuel easy.

Wright Plug Continues Unchanged

Stevens & Company continue the Wright spark-plug without any change. The plug, Fig. 5, includes a conventional electrode design and a copper packing ring between the shell and the bushing. The insulation is of mica, East Indian material being used for the lower and South Dakota mica for the upper portion of the insulation.

Janney Steinmetz Flash Light

Janney, Steinmetz & Company, Philadelphia, Pa., make the Flash Light plug, Fig. 22. This plug is of the porcelain insulation type, this part being wrought heavily and with ample clearance between electrode and insulating material. The electrodes, both positive and negative, are made of platinum-covered steel wire and all parts of the spark plug are designed on such a scale as to produce a heavy-duty product capable of withstanding severe strains.

Mezger Soot-proof Spark-Plug

Under the name of the Soot-Proof spark plug the C. A. Mezger Company, Inc., New York City, manufactures a product distinguished from all other plugs by the form of the porcelain insulation. The latter is formed with a shoulder and a wide flare extending back into it at the lower side, so that there remains a considerable distance between positive electrode and porcelain. By this expedient sooting of the plug is averted, as a carbon deposit between electrode and porcelain would offer more resistance to the current than the air gap between the point and the negative electrode. The joints are kept tight by means of copper gaskets.

Disco Acetylene Starter Plug

The Ignition Starter Company, Detroit, Mich., brought out an acetylene starter plug during 1912. This plug, Fig. 7, is formed with a specially shaped shell. The latter has a vertical bore opening adjacent the spark gap and communicating with a laterally extending tube in the upper part of the shell which may be connected to the distributer valve of an acetylene starter. The insulation is porcelain.

Charles E. Miller Special Plug

Charles E. Miller, New York City, is having manufactured a special spark plug for his business. This plug is designed along conventional lines, consisting of a steel shell and bushing, a porcelain insulation, alloy steel wire electrodes and a terminal screw shaped in Fig. 20. The plug is said to be manufactured in large quantities and will be ready shortly.

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Wasting Current in Garages

Among the principal items of garage overhead expense is the light bill. Anything that serves to reduce this expense must prove a great help to the garage operator, whose profits are, at any rate, limited. As in the garage and repair shops incandescent lamps installed as drop lights are used mostly, a great waste in their application is encountered. The fact is that it is very comfortable to light a drop light, as well as to pull the chain in order to turn it out; but few people think of the second act of the play and the lamp consumes electricity long after he who turned it on has ceased requiring it. Sometimes lights are burning for hours without any purpose and unnoticed by any one. It would pay for the garage owner to employ a boy for the express purpose of looking after the lights and see that tools after use are returned to their proper places. Furthermore, such a boy could give the men a hand, at least to the extent of procuring the tools, etc., which they require during their work, and the saving of the skilled men's time would almost pay for all of the boy's work. The owner of any fairly large garage who takes the trouble to inspect his establishment regularly with a view of verifying the above statement on the waste-light question will find that in many cases the saving of unnecessarily used current would more than pay for a boy's wages. Almost the same may be said for the lost motion incurred by men working around the garage and on cars, who often leave their work for 10 or more minutes to do some small job which might as well be done by a boy of 13 or 15 years. It is obvious that such a waste of labor is among the most serious influences which make for inefficient and uneconomic garage management.

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The present practice for compression pressure in the modern touring car averages about 65 pounds to the square inch, cold. There are some cars, however, which run as high as 85 and 90, although it is very undesirable to go quite as high as the latter figure in a small or medium-powered car used for touring purposes. If your compression is above 85 pounds it would be well to reduce it. Take your compression, however, by gauge, which could be inserted in the spark-plug aperture, rather by attempting to determine it by volumetric computation.

Running with a rich mixture is a prolific cause of carbon trouble. Try cutting down the gasoline a little on your carbureter.

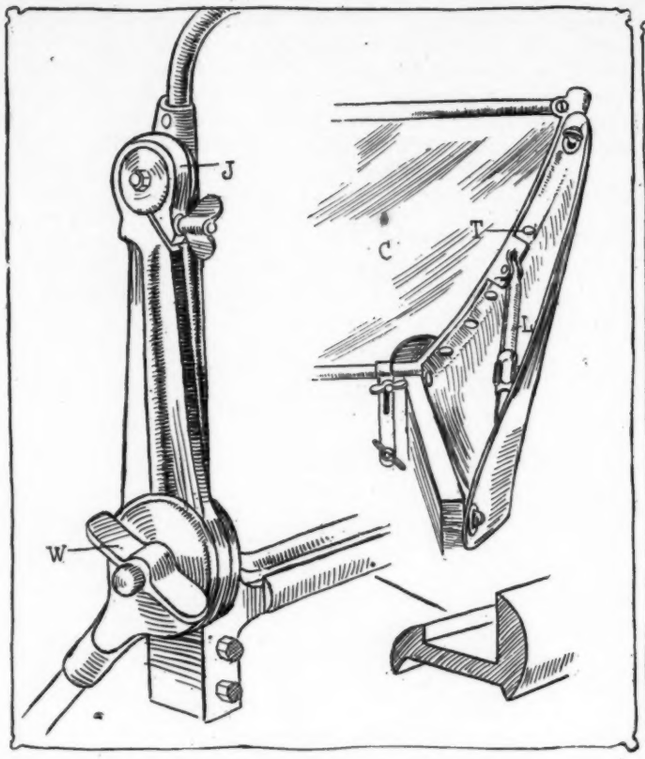


Fig. 1—Cox shield. Fig. 2—Perfecto deflector

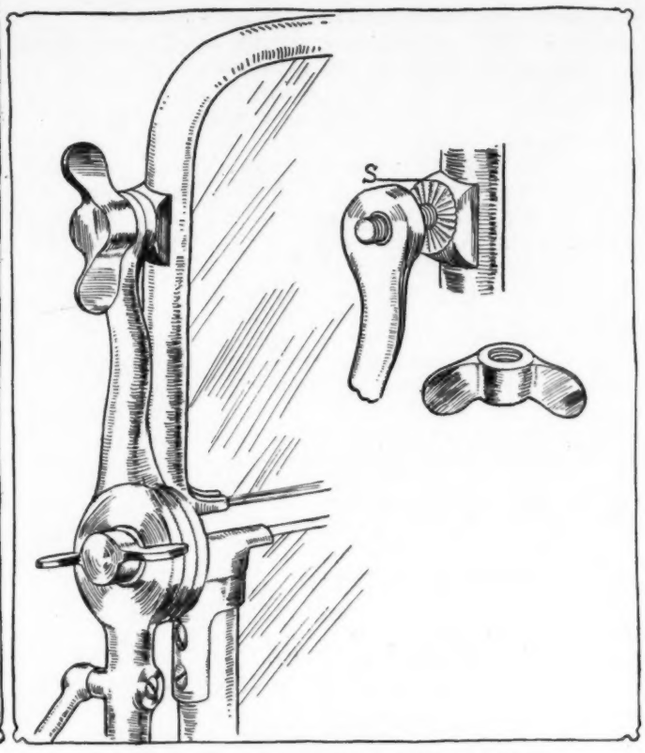


Fig. 3—Cox two-pane shield and joint design

Windshields at Show

Devices seen at the Garden and Palace show many new features which make for ease of operation and effective protection of the driver against air currents rushing against the traveling car. Heavy glass panes held in metal frames capable of varied adjustment constitute the majority of types, although flexible or elastic designs are also in evidence. Improvements tend to make the shields useful under any conditions, especially in inclement weather.

WINDSHIELDS seen at the Palace and Garden shows constituted by no means a complete exhibit of the products manufactured in this branch of the accessory industry. As a matter of fact the number of windshields exhibitors was small and the goods shown, therefore, far too sporadic to be truly representative of practice. This becomes very clear when one considers that fully four score manufacturers make windshields of some design or other, while less than half a dozen of these makers were represented at the show.

The exhibits formed, nevertheless, what might be termed an illustration of the manufacturing trend in windshields. They showed that in designing these accessories the producers always carry in mind certain ideas which tend to make the working of the shield easier and the shields themselves more effective than before. As several of the shields shown are designs which have continued without changes for 2 or 3 years a comparison of these products with the latest designs afford an excellent opportunity of studying just what changes windshield designs are undergoing and what specific ideas the makers endeavor to incorporate in their wares.

The advantages which are being striven toward seem to be great flexibility, more secure attachment, ample protection in combination with the directing of a slow air current toward the driver, perfect transparency of the shield at all times and strength of all parts to reduce the probability of breakage.

Taking up in turn these requirements it is interesting to note how they are being met at present by various designers of windshields.

1. **Flexibility**—While a year ago there seemed to be a decided trend toward the elastic shield made of celluloid or a similar material, glass seems now to have regained its former reigning position. Instead of making the transparent material flexible the makers seem to prefer, in most cases, the use of a number of rigid plates held in individual frame sections, which are individually movable and make possible the use of a variety of positions of the shield. Two and three-pane shields are appearing, in which the individual plates and their frames are connected by specially constructed joints, the latter being so designed as to permit the holding of a pane in four, eight or more positions. The joints themselves are supported on vertical and inclined rods, through which the whole shield or part of it may be shifted forward or backward, giving the possibility of a rain-vision arrangement of the plates.

2. **Secure Attachment**—This condition is fulfilled by the aforementioned vertical and inclined rods or struts. Each of the latter, namely, the inclined, is attached at one end to a shield side support and at the other to the floorboard of the car in such a way that the length of strut between the floor and the vertical side member may be lengthened or shortened to give the above referred to flexibility. Tight adjustment is obtained by various simple mechanical devices.

3. **Protection**—While the protection given by the elastic, curved windshield lies in the deflecting of the air currents above the head of the driver the glass shield achieves this end in a different manner. With multiple pane shields the upper pane is either vertical or slightly inclined so that practically all the air met is caught on its surface, striking the latter under an almost right angle and exerting a considerable pressure on the entire glass surface. The latter must therefore be substantially mounted, more so than the elastic shield, and this is done by the metal rods mentioned under 2. To obtain some ventilation for the passengers of the front seats the upper, and, in some cases, also the lower panes are movable and a little air is permitted to enter between both panes, and this

air being distributed all through the front compartment of the tonneau gives ample and pleasant ventilation.

4. **Transparency**—It stands to reason that the protection given by the shield must not be balanced by the evil effects of an impaired vision on the part of the driver. Especially in rainy weather it is a problem to keep the shield clear in front of the driver, and special windshield cleansers have been designed by various companies to remove moisture from the surface with one movement of the hand.

5. **Strength of Parts**—Multi-pane windshields are made of brass or steel rods and heavy plate glass. The latter feature is necessitated by the fact that every windshield is now and then struck with hard or soft objects and must be strong enough to withstand a moderate blow. Of course, plain glass cannot stand a collision with a metal or stone object at high speed, and though laboratory experiments have demonstrated wire-reinforced glass to be much better adapted for windshield requirements than plain glass not a single shield seen at the exhibition showed the adaptation of this knowledge. With flexible or elastic designs strength is not half so great a problem as in the case of glass models. Leather and metal strips afford the necessary rigidity and no more.

Individual Shield Makers

Coming to the specific exhibits the Cox Brass Manufacturing Company, Albany, N. Y., has seven different shields. All of these are of the metal-glass class, and two original designs are shown in Figs. 1 and 3. The first is a one-pane model which attaches to the dash and is adapted to swing forward with its lower edge, opposite movement being prevented by the upward projection of the base beam shown in cross section. The frame of the pane is of round section and is held in place by two grip members each attached to a joint J. The latter is a friction joint, the internal member of which may be turned after loosening the wing nut which holds the surrounding annular shoe tight upon it. The wing nut W holds the upright side arm in positive relation to the inclined strut and the horizontal base member of the shield, the arm ending in a flat ring, both sides of which are fashioned with ratchet faces and engage similarly shaped faces on the ring attachments of strut and base. The model, Fig. 3, has two panes, the lower of which remains stationary with a given length of the strut; the upper pane may be swung forward or backward by suitable adjustment of the vertical side arms, all joints being of the serrated or ratchet face type illustrated at S.

The Garage Equipment Manufacturing Company, Milwaukee, Wis., showed the shield, Fig. 4. The lower pane is held under an incline by the vertical strut, to the end of which a friction joint is fixed; a friction-material ring between two metal rings, which are attached to the upper and lower panes respectively, constituting a friction joint. The knurled nut holds the metal and material rings in engagement.

Fig. 6 shows the Polson windshield, made by the Polson Manufacturing Company, Buffalo, N. Y., which is constructed in a manner entirely different from the foregoing designs. The frame of the shield consists of two upward side members which have right angles at their lower ends, through which they are attached by screws to the dashboard. Both the upper and lower panes are independently movable, through a full circular arc, around their pivot joints. The latter consist of friction plates, as illustrated in the case of the shield, Fig. 4. Each pane is held in round-section frame arms, surrounding it on three sides, and the upper edge of the lower pane, as well as the lower edge of the upper, are free from metal, making a clear contact when both panes are vertical.

The only elastic shield seen at the show was the Perfecto, made by the Perfecto Wind Deflector Company, Boston, Mass. This shield consists of celluloid C slightly concave when seen from the front and reinforced at the edges by metal rods. The side edges are attached to leather strips by wing nuts T, Fig. 2, passing through eyes in the leather; the leather is part of the side element—there being two in every shield—and being secured to the car body by wing nuts as shown. A link L acts as a strut and holds the flexible side material tight and the celluloid shield in an approximately constant position.

Windshield cleaners for rainy weather were shown by the Emil Grossman Company, New York City, and the Gabriel Horn Manufacturing Company, Cleveland, O. The first device consists of a strip of so-called squeegee rubber clamped to a brass rod; the rod is movable along the shield by means of a split ring to which it is attached and which slides on the upper horizontal frame member. The Gabriel cleaner consists also of a rubber strip held in a longitudinal metal clamp and in contact with the glass pane. The upper end of the clamp is hinged to a split ring slidable on the top frame member; it may be turned around the hinge and moved over the glass surface by pulling a cable or cord suitably connected to the steering wheel or any other position desired.

Another novelty is the Tobey glare remover, Fig. 5, which is designed to protect the driver against the headlight glare of automobiles met on country roads. This device is a circular dark yellow glass plate attached to a rod and by the latter to a rubber-faced clamp which may be slipped over either a glass or metal edge. The device is so installed that when a car with glaring headlights is met with the driver bends his head slightly to the side and looks through the yellow glass.

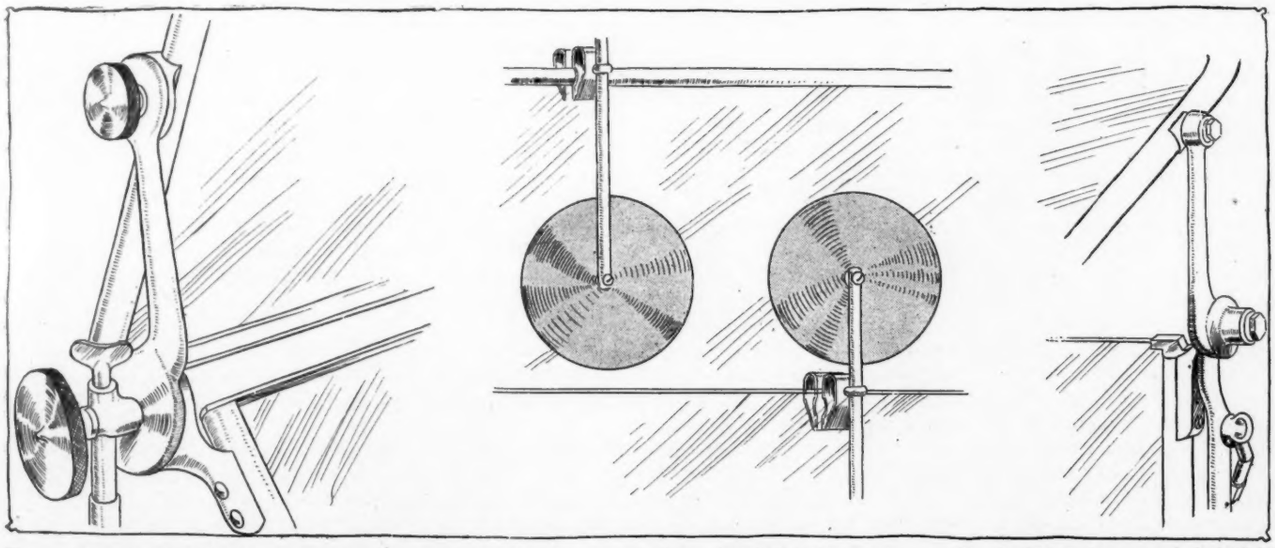
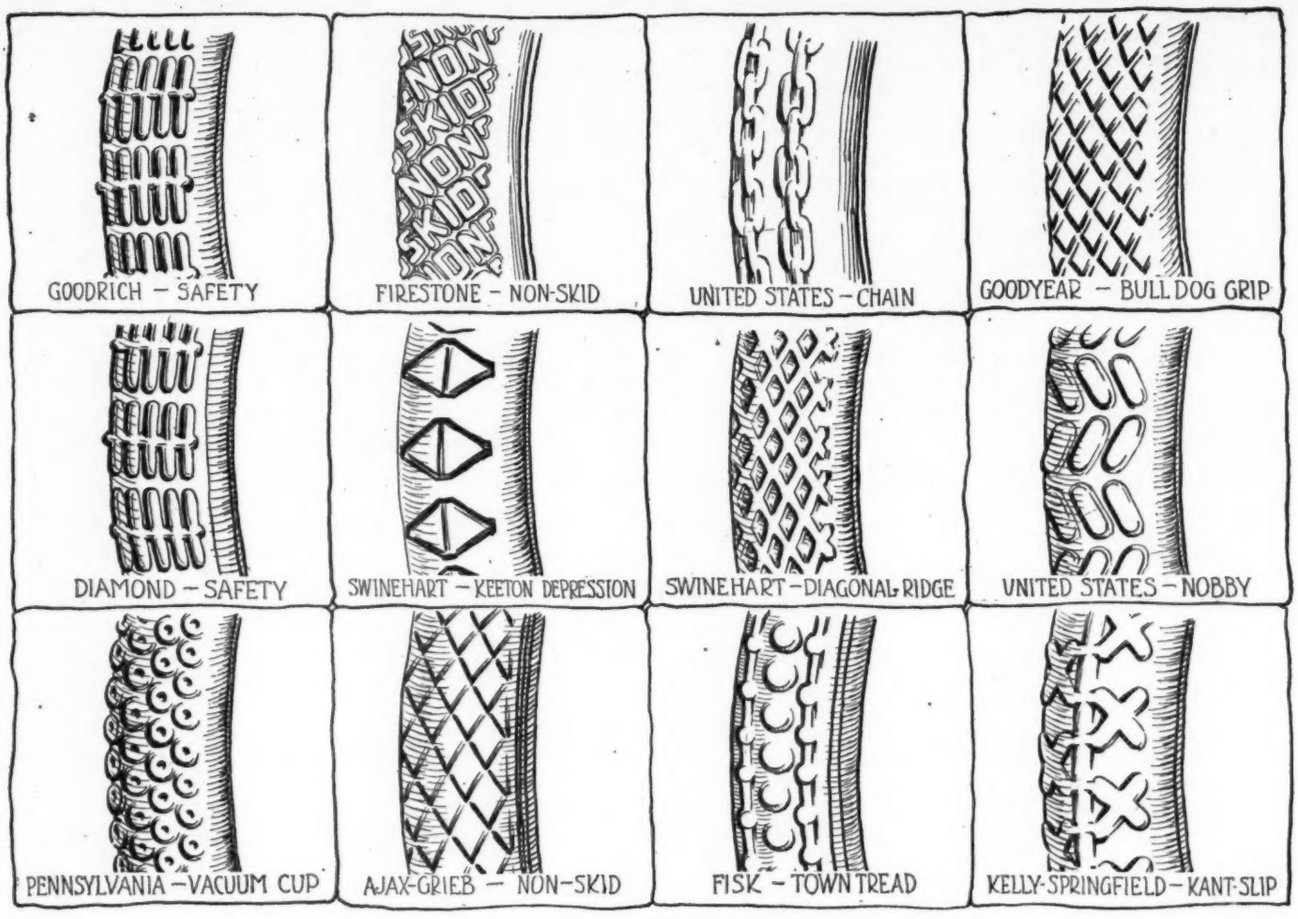


Fig. 4—Garage Equipment Manufacturing Company's shield. Fig. 5—Tobey headlight glare remover. Fig. 6—Polson two-pane windshield



A dozen leading types of anti-skid tires for the present motoring season

Tire Progress Shown by Anti-Skid Treads

The progress of pneumatic tires during the year consists largely in the production of anti-skid tread types and in the manufacture of special pneumatics for electric passenger vehicles. There are over a score of different types of anti-skid treads now on the market by important tire builders and nearly as many more by tire makers of local territories.

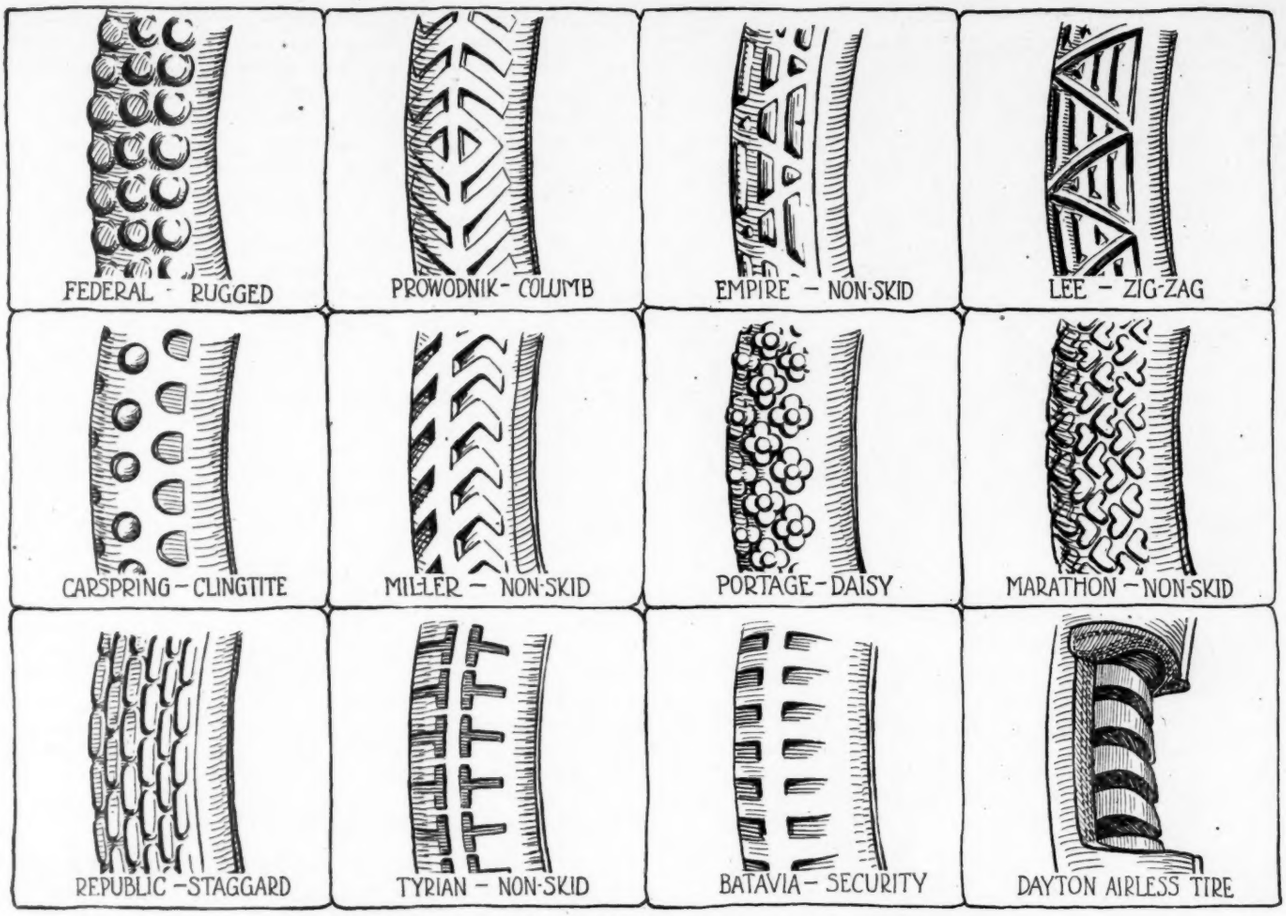
HOW many motorists keep a tire mileage book? Unfortunately, very few. The book must be kept by the chauffeur, or rather should be, and where there is one driver who will take the trouble to keep tab on tire expense, there are 99 who will not take the trouble. The tire mileage book will tell its tale, and if one takes the trouble to turn back the pages several years and compare the average mileage then with that obtained at the present day it will be immediately apparent that tires have very much improved.

From a superficial inspection of the pneumatic tires themselves very little would be learned. Process of manufacture and experience in choosing the right materials are the keynotes of the success.

The tread of the tire has received more attention than any other part during the last year, and in a few words this situation resolves itself into one of types of treads. Treads may be subdivided into two classes: first, where the design is, so speak, superimposed upon the main tread and, secondly, where the tread is indented so that a vacuum is created between the road bed and the tire and as soon as the tire starts to roll or skid, the sharp edges of the incisions reduce slipping to a minimum. In both cases there is an additional thickness in the tread than in the case of the plain round-tread tire, affording greater wearing surface and consequently increased tire life.

There is a growing tendency among the majority of owners to take advantage of the oversize standard tires that are manufactured by nearly every maker of repute. When the car is delivered by the makers, it is usually fitted with one of the standard size rims and tires of a corresponding size, but after the first set of tires have worn out, replacements are generally made by substituting for the worn tires others of oversize dimensions. Many people puzzle their brains to remember what the oversize standard is for some particular make. There is a simple rule which is not hard to remember, namely, by adding 1 inch to the diameter and .5-inch to the width of any standard size tire, one obtains the size of the oversize tire that will fit the standard rim.

The question of loss of power or absorption of energy in tires of different makes has stimulated makers to study the tire question from a different angle. The electric vehicle has been in a measure responsible for this and there are quite a number of makers of regular pneumatic tires who have turned their attention in this direction. The speed of the electric is nothing like that of the gasoline vehicle under normal conditions, and consequently the tires for the former type do not have to be so robust. Resiliency is the word that is usually employed to



Another dozen types of anti-skid tires for the present motoring season

describe a tire that is capable of absorbing part of the road shocks instead of imparting them through the mechanism of the vehicle. By making tires more resilient it is claimed that the current consumption of an electric car can be reduced by 25 per cent. If this is true, and official tests prove that it is, there is no reason why the power of a gasoline vehicle cannot be increased at the road surface or the same power that is now expended can be obtained with a reduction in the gasoline consumption. From the foregoing remarks it would appear that there is still scope for tire makers to increase the resiliency of their tires without reducing the wearing qualities. Of course, if the resiliency were left as it is and the lasting qualities increased the same results would be accomplished as by the other means.

Many of the tire companies which have had a type of non-skidding tread in the past and which have been satisfied with the results have continued the manufacture without any modifications. Among these may be mentioned the United States Nobby tread, the Firestone with the embossed lettering. Goodyear and Ajax with rectangular corrugations and the Republic Staggard tread. The fore-runner of the different treads to be found at present was undoubtedly the Bailey, and this type is still listed by many makers.

Many new designs of tread surfaces have been evolved during the last year or so. It would be impossible to enumerate all of these, but among them are the Vacuum cup, Safety and Chain types.

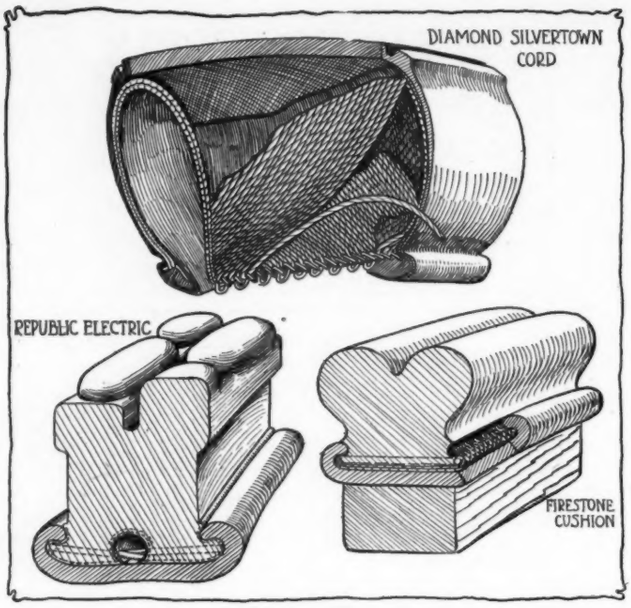
A type of tire that has earned a good reputation, owing to its freedom from rim cuts, namely, the straight sided tire, is being listed for the first time by several makers. Another type of tire that is not new, but which is receiving more prominence this year, may be cited as practically the only thing new in pneumatic tires. This is the cord tire. It consists of a series of cross strands of rubberized cord used where the conventional layers of duck or, as it is more often termed, fabric, are usually employed.

Goodrich—New Safety Tread

In addition to the regular line of plain tread, Bailey tread and metal studded non-skid tires the B. F. Goodrich Company, Akron, O., has placed a new type of tire on the market in the form of the Safety tread tire. A view of this tread is shown in Fig. 1. It consists of a series of five bars of rubber running parallel with the circumference of the tire, each series of bars being intersected in the middle by a single bar placed at right angles to the others. A suction effect is produced as the tire passes over wet ground and the numerous projections grip the roadbed, thereby preventing undue slipping. Another new tire made by this company is the Goodrich cord for electrics. Most types of tires may be had this year with a straight-sided bead.

Diamond—New Squeegee

A tire with a new tread was brought out by the Diamond Rubber Company, Akron, O., during the latter part of last year and forms one of the features of this year's line. The tread is known as the Diamond Safety Tread or Squeegee and is similar to that described above made by the Goodrich Company. The tire was first brought out by the Diamond Company. The tire is convex, and provided the correct pressure is maintained only three of the bars contact with the ground under normal running conditions until such time as the tread has worn down sufficiently to allow the two outside to come into contact. In going round a corner the tire is usually caused to bulge in the opposite direction to which the turn is being made, and this action *per se* brings the outside



Three 1913 tire types

bar into contact with the road surface and arrests skidding action. The Diamond Silvertown Cord tire is built up of a series of cord strands instead of fabric. Each strand of cord is composed of many finer units or strands thoroughly impregnated with rubber solution. The bead has a series of wire hooks and with the aid of special machines the cord is passed over a layer of coated fabric at an angle of 45 degrees to a cross-section of the tire. The machine regulates the tension of the cord rendering it uniform throughout. After the first layer of cord has been applied a layer of rubber is placed over it to separate the first layer from the second. This latter is applied in a similar manner to the first, only in the opposite direction. For example, if the first layer is applied from right to left the second layer runs from left to right crossing the first at right angles. The second layer of cord is covered with a sheet of pure rubber, which in turn is encircled with a layer of fabric acting as a breaker strip. The tread is then applied, after which the bead is put on.

A new composition known as Vitalized Rubber is being employed by the Diamond company this year and is being used in the treads of tires of this make.

Pennsylvania—Vacuum Cup Tread

The distinctive feature of these tires made by the Pennsylvania Rubber Company, Jeanette, Pa., is the form of tread employed known as the Vacuum Cup tread, Fig. 1. The entire tread is encircled with four rows of circulars protrusions with hollow hemispherical cores. As these pass over the road surface while the car is in motion each cup forms a suction grip. The suction action has no retarding effect, as the edge of each cup is automatically raised edgewise and its hold released by the rolling of the wheel.

A new departure in tire making was recently introduced by this concern by oil-proofing the treads of these tires. It is claimed that by a special compound a tread has been developed that is oil-proof.

Firestone—Adds Electric Tire

There is nothing new in the way of gasoline pneumatic tires being offered by the Firestone Tire & Rubber Company for the coming season. The non-skid tread with the words Non-Skid embossed forms a series of angular projections, increasing traction and preventing skidding.

A new Firestone clincher cushion tire for electrics is the latest addition to this product. A feature of this tire apart from any other is that it can be fitted to any ordinary standard clincher rim without alteration. The tire has somewhat the appearance of a dual tire with a single base, Fig. 3. The outer portion of the tire is built with an overhang and the base is of the same resilient compound as the tread. The dual tread, by means of the cut-in center, allows the rubber that is displaced when passing over obstructions free expansion. It is claimed that when the tire moves sideways in beginning a side skid the outer of the two treads rubs the moisture from the road surface, permitting the second tread to obtain a grip upon a dry place and thus prevent the skid. Further, the curved-in section creates a suction upon the roadbed.

Goodyear—Continues Bulldog Grip

The Goodyear Tire & Rubber Company is continuing the type of tread known as the Bulldog grip, which was placed on the market in 1911. It consists of a series of deep cuts in the tread forming a large number of diamond shaped blocks—Fig. 1. These present to the road surface countless edges and angles, facing in every direction. Each of the blocks widens out at the base, thus preventing any possibility of tearing loose.

The effect of widening the base is to evenly distribute the load over the entire width of the tread that contacts with the road. The non-skid tread is separate from the regular tread and is vulcanized over the latter. It is claimed that the passage of air through the corrugations of the tread assist in keeping the tire cool. A feature of Goodyear tires is the straight-sided bead which prevents rim cuts, at the same time affording increased air capacity. Goodyear tires are 10 per cent. oversize and a double cure process is employed in their manufacture.

Republic—Adds Staggard Electric Tire

These tires have undergone no material change during the last year and are manufactured either in plain tread or with a non-skid tread. A new electric tire has been added to the line known as the Republic solid staggard electric tire, Fig. 3. The studs on the tread are so arranged that the intervals between the studs in one row come exactly opposite the studs of the adjoining row. There is a deep depression or groove between the two lines of studs increasing the elasticity of the tire. This type of tire will fit any clincher or quick-detachable rim. Cross wires are inserted in the base, to prevent the tire from creeping or pulling off. They are made in four sizes.

United States—Three Types of Tread

United States tires for gasoline cars are manufactured with three types of treads; namely, plain, Nobby and Chain. The Nobby tread is too well known to need much explanation. It consists of a series of protrusions on the tread, three in a row, and placed alternately at opposing angles; that is to say, the knobs in one row run from left to right and the next row face in the opposite direction, Fig. 1. The effectiveness of the all-rubber non-skid tires is proportionate to the life of the raised sections and if these are high enough to offer broken contact to the road surface after several thousand miles running there is no reason why the effectiveness of the non-skidding properties should not remain.

A new tread in the form of a double chain encircling the tread was placed on the market last year. As the name Chain tread implies the new idea is an adaptation of the chain to pneumatic tire construction, Fig. 1. Additional traction is obtained and the links create suction upon wet surfaces, minimizing skidding. The protrusions of rubber which form the chains also offer lateral resistance besides affording additional wearing surface to the tire.

A special electric tire has recently been placed upon the market known as the United States special electric tire, for which greater resiliency is claimed. The fabric or inner framework, instead of being made from square closely woven

fabric, consists of plies of parallel cords entirely separated from one another by cushion rubber so arranged that each assumes its due proportion of the strain when the tire is in service. This in a measure allows the tire to absorb the obstructions of the road instead of repelling them and causing the wheel to be lifted. These tires are being made in a number of sizes and with plain round, Nobby and Chain treads.

Swinehart—Keeton Depression Added

The latest addition to the Swinehart line of pneumatic tires is the Swinehart non-skid tread, Keeton Depression type, Fig. 1. The tread is composed of a series of rectangular indentions in the tire with the corners squared and cut in half by a further indention. Triangular shaped blocks are thus formed with their apex toward the outside of the tread. No matter in whichever direction the tire is moving there are always a considerable number of sharp edges to prevent any slippage. The diagonal ridge type of tread is also manufactured. All Swinehart tires are wrapped tread and of two cure construction.

Fisk—Adds Town Tread

The latest addition to the Fisk line of tires is the Town Tread type. The other types have been continued, including the bolted-on type. The new Town Tread consists of a plain tread with rows of circular protrusions. In the center of the tread the disks are large and are not connected in any way. On either side there are rows of smaller disks, succeeding disks being connected with a rubber bridge, Fig. 1. The outer rows of disks are smaller than the center row. There are two ridges running circumferentially around the tire outside the smaller rows of disks. These ridges do not normally form part of the tread except when rounding a corner or when through a tendency to slip the tire is bulged sidewise.

Ajax—Rectangular Corrugations

The tread of the Ajax non-skid manufactured by the Ajax-Grieb Rubber Company, Trenton, N. J., consists of raised, beveled rectangular corrugations. Besides aiding traction on any road surface the numerous points of contact are of material aid in pulling a car out of bad places. The corrugations and their inter-spaces create a suction upon the road surface, while the tire is moving, thereby minimizing the possibility of slipping on wet roads. Straight-sided tires are beng manufactured for the first time this year. Another feature of these tires is that they are guaranteed for 5000 miles.

Kelly-Springfield—Kant-Slip Tread

The name given to the non-skid tread tire made by the Kelly-Springfield Tire Company, Akron, O., is Kant-Slip, Fig. 1. There is a central ridge running circumferentially around the tire and at either side there are rows of crosses, the sides of which contact with the center ridge, thus forming triangular depressions. These exercise suction upon the road surface, besides offering a large number of sharp protrusions in the event of any tendency to skid.

Michelin—Continues Semelle

The Michelin Tire Company, Milltown, N. J., continues the Semelle anti-skidding tread in which the prevention of side-skid is obtained by the use of flat-headed steel rivets. The tire consists of an ordinary pneumatic casing, identical with the plain Michelin fabric and rubber design, but differing from it by the tread. The latter is of leather, through which a large number of flat-headed rivets pass, the legs of which are bifurcated and bent open on the other side of the leather. These rivets pass through several layers of leather and are held from coming loose by a rubber layer vulcanized to the leather over the bent ends of the rivets. Due to the large number of the small rivets—there are 460 in a 36 by 40-inch tire—the anti-skidding effect produced by them resembles that of a chain; with the difference, however, that the metal objects, which hold on to the ground, are in an infinitely more intimate contact with the tire proper than a chain may be. The work of the rivet-studded tire remains the same for practically all speeds.

Portage—Daisy Non-Skid

The Portage Rubber Company, Akron, O., besides making regular round-tread tires has placed on the market a non-skid type known as the Daisy Non-Skid Tread, Fig. 2. The name is indicative of the form of the tread. There are three rows of rubber protrusions in the form of daisies offering countless edges and angles to the road surface. The daisies are added as an extra tread to the regular smooth casing. Portage tubes are also manufactured and delivered in sealed boxes.

Tyrian—Hold-Tite Tread

These tires are manufactured by the Tyer Rubber Company, Andover, Mass. They are distinguished by a white rubber tread. A non-skid type, known as the Hold-Tite, Fig. 2, is made, the tread of which consists of two rows of capital T's running around the entire circumference of the tire. This forms a tread with a plain center, two rows of intersected indentions parallel to the tire and a series of cross indentions formed by the base of the letter T.

Federal—Four Tire Types

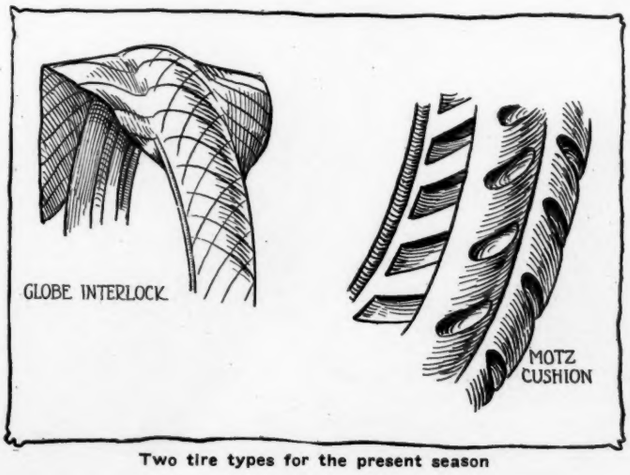
These tires are made in four types, by the Federal Rubber Manufacturing Company, Milwaukee, Wis. These are: The regular clincher round tread, quick-detachable round tread, straight sided detachable round tread and the Rugged non-skid tread. This latter, Fig. 2, consists of a series of large studs arranged parallel, three in a row, forming an integral part of the tread. These studs expand outwardly at the base, preventing them from tearing off under severe strains.

Globe Interlock

These tires are manufactured by the United & Globe Rubber Manufacturing Company, Trenton, N. J., and the principal point of difference between these rubber tires lies in the method of forming the carcass. Instead of wrapping the fabric circumferentially around the tire, strips of fabric are cut on the bias and laid diagonally across the body of the tire. Two layers of rubber-coated fabric are placed one upon the other, Fig. 4, thus forming intersecting strata, one ply running one way and the second in the opposite direction. The tire is made with either a plain or non-skid tread.

Dayton—Airless Tire

These tires are primarily intended to take the place of a pneumatic and perform in the same manner as a pneumatic only without the inconveniences of air. Externally the tire presents the appearance of an ordinary pneumatic, but instead of a tube the inside of the tire is built up of numerous sections



Two tire types for the present season

of rubber and straight cut fabric in the form of arch supports. These supports are spaced apart, so that when the tire passes over an obstruction, the rubber can be momentarily displaced and after passing the stone or rut resume its normal shape, the piers of rubber vulcanized to the casing becoming part and parcel of it, as can be seen in the illustration of a section in Fig. 2. These tires are manufactured by the Dayton Rubber Manufacturing Company, Dayton, O., with either plain or non-skid treads.

Empire—Uses Red Rubber

These tires are manufactured by the Empire Tire Company, Trenton, N. J., and are distinctive in appearance, being made from red rubber. The non-skid tread consists of four ribs, Fig. 2, running circumferentially around the tread of the tire and intersected at intervals by diagonal grooves. The grooves are zig-zagged so that the protrusions form a shape of a series of pyramids whose apexes alternate from one side to another. This concern also manufactures Peerless red tubes.

Motz—Electric Cushion Tire

The Motz Tire Rubber Company, Akron, O., manufactures a cushion tire especially adaptable to electrics. It is virtually a solid tire offering a dual profile to the road surface. In order to create a cushioning effect when going over road obstacles the sides of the tire are undercut slantwise, and the tread is of the tire is undercut at intervals to afford good traction and to prevent skidding. Increased surface contact is claimed for this tire.

Racine—New Trusty Tread

A new type of tread known as the Trusty has been placed upon the market by the Racine Rubber Company, Racine, Wis. It consists of three rows of elongated rubber studs, the center row being aligned with the circumference of the tire and the two outer rows being set irregularly so that the brakes between studs in the inner and outer rows do not come opposite each other.

Carspring—Introduces Clingtite

These tires are manufactured by the New Jersey Car Spring & Rubber Company, Jersey City, N. J., and are made in plain and anti-skid tread types. The Carspring anti-skid tread, known as the Clingtite tread, differs in many respects from others at present on the market. The tread is to all sense and purposes smooth with a series of holes indented at intervals, Fig. 2. The holes look as if a rubber ball were beneath them; that is to say the rubber comes to an apex in the center of the hole, tapering off to the sides. On either side of the row of holes there are a series of arches cut into the tread decreasing in depth from the point nearest the center of the tire. The center holes form a suction on the road and increase traction and the side slots or arches offer sharp edges to the road in the event of a slip. This concern also makes red inner tubes.

Miller—One-Cure Type

Miller tires are manufactured by the Miller Rubber Company, Akron, O., and the method employed is what is known as the one-cure, wrapped tread type. The wrapping of the fabric is effected by means of specially designed machinery and the final vulcanizing is carried on in live steam instead of molds. Besides the usual line of plain tread tires this concern makes the Miller non-skid, Fig. 2. The tread of the non-skid tire presents the appearance of two series of V's placed one over the other on either side of a center line. The apex of the V's on one side points in the direction in which the car is traveling, while those on the other side point in the opposite direction.

Batavia—Security Tread Continued

These tires are manufactured by the Batavia Rubber Company, Batavia, N. Y., in a variety of treads and beads. Among these may be mentioned the Security tread, Fig. 2. This consists of a series of corrugations or notches equidistantly spaced apart from a rib running circumferentially around the tire.

Favary—Mechanical Tire

This tire is made up of a series of rubber-coated bands of fabric spaced apart by small supports, the tread consisting of solid rubber. When an obstruction is encountered the supports beneath the layers of fabric move in such a manner as to allow the fabric to flex and thereby absorb the obstruction and giving the tire a degree of resiliency.

Brown Scientific Tubes—Extra-Thick

These tubes are manufactured by the Voorhees Rubber Manufacturing Company, Jersey City, N. J., and consist of a red rubber tube which has a layer of fabric running through the rubber at the point equivalent to the tread of the tire. This section of the tube is materially thickened. The fabric is non-elastic.

Interlock—Inner Tires

These inner tires consist of a series of layers of fabric vulcanized together, and placed inside of an ordinary outer casing between it and the inner tube. In order to prevent the inner tube from being pinched, the lining is made wider than the tire and the two edges lap one over the other. These have been improved and are now rubber coated externally.

Reason—Non-Blow-Out Inner Casing

This device consists of an interliner between the outer casing and the inner tube. As it takes up a certain amount of space inside the tire, a smaller inner tube than usual is used with it. In order to give the additional thickness a degree of elasticity, air pockets are introduced, forming cushions, the liner consists of two rows of rubber-coated fabric and one breaker strip a layer of white rubber in which there are a number of air cells. Between this layer of rubber and the inner tube there are two more layers of rubber-coated fabric.

Prowodnik—Non-Skid Columb

These tires are manufactured in Russia and handled in this country by the Russia Tire Sales Company, of New York City. A non-skid type known as the Columb, Fig. 2, consisting of a wide rubber ridge running around the center of the tread. This rim is supported by a number of ribs in the form of a herringbone. In order to insure equal traction and non-slipping properties the angles of the ribs alternate, that is to say several of the ribs face one direction followed by a series facing in the opposite direction.

Marathon—Angle Tread

Marathon tires are manufactured in round tread as well as angle non-skid treads by the Marathon Tire & Rubber Company, Cuyahoga Falls, O. The term Angle tread describes the type of tread employed. There are five rows of right angles, in the form of protrusions, above the surface of the tread as shown in Fig. 2, each successive row having the angle facing in the opposite direction.

Lee—Adds Lee Zig-Zag

In addition to the regular plain tread puncture-proof tire manufactured by the Lee Tire & Rubber Company, of Conshohocken, Pa., a non-skid tire has been added known as the Lee Zig-Zag. The puncture-proof device consists of three layers of circular disks, each layer overlapping the other and separated by a cushion of rubber. The new non-skid tread, as the name denotes, consists of protrusions passing diagonally around the tire from one side to the other, the spaces between the diagonal lines being partially filled with small projections increasing in size from the apex outwards, Fig. 2.

Shock Absorbers Show Improved Details

Friction, Spring and Dashpot Devices Mostly Unchanged and Number of New Apparatus Is Small

As in previous years, the large majority of shock absorbers produced operate on the friction principle, spring being used more frequently to act supplementary to the ordinary suspension, while dashpot designs are limited to expensive cars.

FEW new types of shock absorbers have appeared this year, although there have been several changes in existing types in order to make them more effective. The ideal absorber of road jars must dampen the great spring vibrations, but it must not perform this function at the expense of the resiliency of the springs. This difficulty has been experienced with earlier types, which, while they prevented big road inequalities from reaching the occupants of the car, had stiffened the spring action, taking from the suspension its smoothness and defeating the purpose for which it is intended.

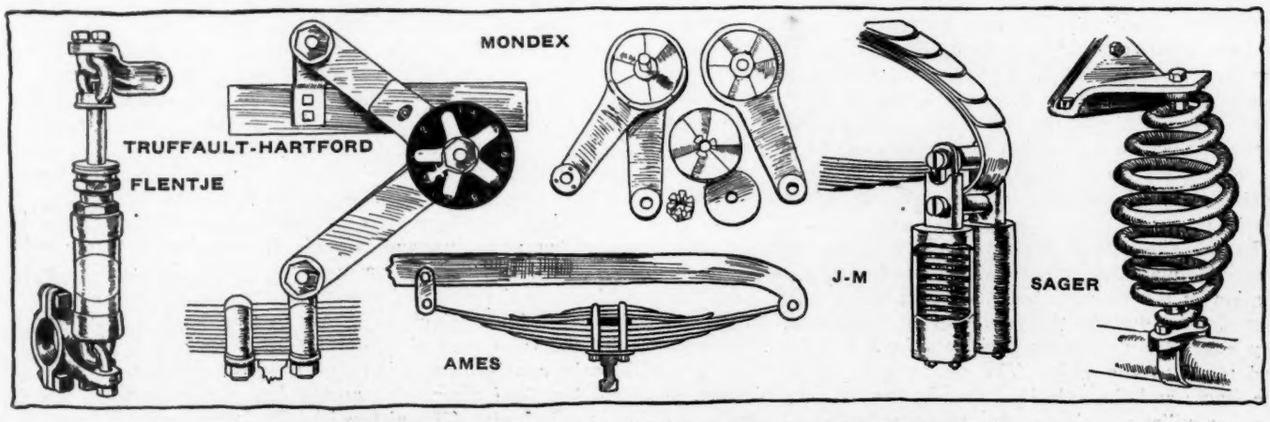
Shock absorbers generally operate on one of three principles, viz., friction, fluid resistance (dashpot action) or equalizer spring action. There are combinations of these various methods of operation. For instance, in one type both friction and spring action are utilized. Absorber makers have in the main designed their devices for application to all makes of cars, and have developed special brackets or other necessary attachment features to meet any conditions.

In lengthening the life of the automobile as well as in adding comfort for the passengers, some form of road equalizing arrangement is of great value. Many car manufacturers realize the part which shock absorbers play in the reduction of depreciation, and there is an increasing number of them who are fitting their cars with some form or other as standard equipment.

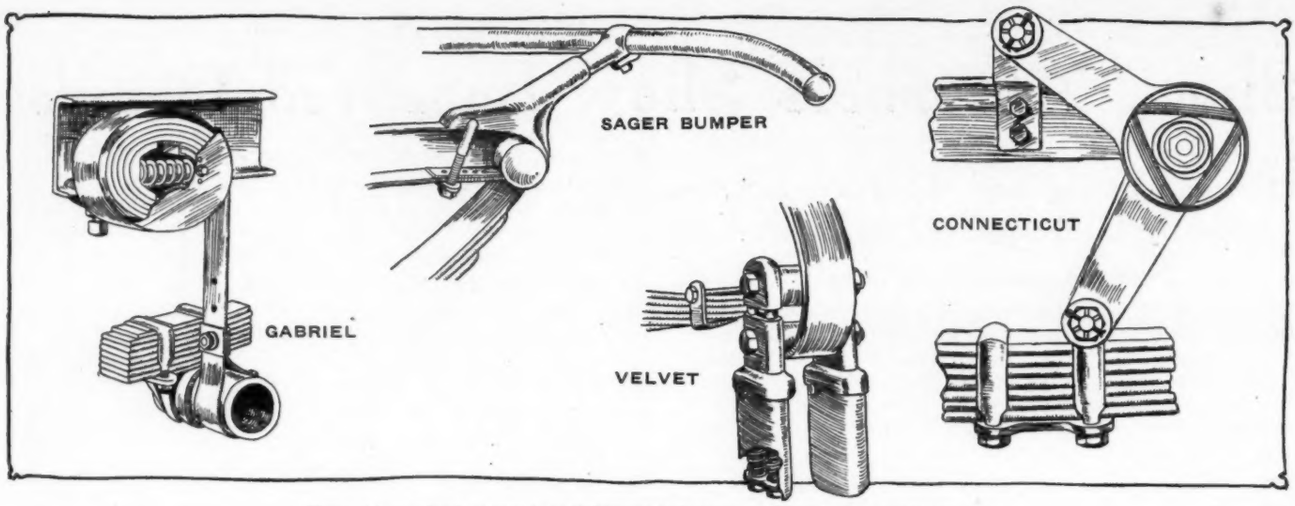
Truffault-Hartford—This shock absorber is of the scissors type, and consists of a single arm attached to the frame of the car and a double arm, frictionally jointed by a bolt and adjusting nut, as shown in the illustration. The upper arm works between the two parts of the lower, giving a straight up and down movement. The upper arm is made of spring steel and therefore allows for any side sway. This arm carries a flanged cover, forming a cup-like space on either side, in which spaces the friction plates are placed. Each of the friction plates is covered by a flanged steel disk which fits to the flanged cover and prevents dust and water from reaching the friction disks. A bolt carrying the friction adjusting nut holds the parts together. By tightening up on the nut any degree of friction is obtained, and the action of the shock absorber modified to produce soft or stiff suspension, in accordance with the wish of the car passengers or the driver.

The sketch shows the new Truffault-Hartford type, which is a refinement of the standard model. An auxiliary short arm has been inserted which follows the direction of the upper arm. It is placed between this upper arm and one of the friction disks. In its upper end, this short arm has a slot cut about 1 inch in length. A knob or projection from the upper main arm fits in this slot as shown. The idea of the new feature is to absorb small vibrations without in the least interfering with the resiliency of the springs. When the springs sink a small amount, the long arm descends a like amount and the metal projection slides down in the short arm slot. Since there is no friction between this short arm and the upper arm, they slide over each other and only one friction disk is brought into play, thus making for slight frictional resistance. But when the vibration is large, the upper arm is depressed a greater amount and its metal button finally reaches the end of the slot, when it moves the small arm also. This brings the outer disk which is in contact with the other side of the small arm into play, doubling the friction acting against the shock. Thus the frictional tension varies in proportion to the shock. In addition to the automatic model, there are four other sizes for different sizes of motor cars.

Mondex—This absorber is one of the scissors design. It is placed between the frame and the axle at the side, controlling the spring movement up and down. There is a single arm attaching to the frame, while a double arm is fixed to the axle. The lower arms are jointed one on either side of the upper arm. In the makeup of the joint of the two sets of arms, there is a series of inclined planes of high-carbon steel working against smooth brass. These ride upon one another on the wedge principle, thus expanding and contracting disks of firm resilient rubber. This rubber cushioning rapidly increases in resistance the further it is compressed, so that the magnitude of the shock is met by a corresponding resistance, it is claimed. The difference between the downward motion and the upward recoil of the spring is met by having a greater amount of rubber compression on the upward movement than on the downward. The illustration



Five types of shock absorbers designed to produce easy riding in 1913 cars



Four other shock absorber designs which have met with the public favor

shows the wedge disks and other parts which go into the makeup of the device.

Connecticut—The Connecticut is similar in outward appearance to the scissors types already mentioned, and it fastens to the car in much the same way. There is a single upper arm attached to the frame, while the lower part is in two sections. Referring to the sketch, it is seen that the working elements consist of a three-face cam working between three sets of flat springs of suitable tension to give the necessary resistance for different weights of cars. These springs are three to a set and placed in a triangle within the retaining shell or cup with an anti-friction material inserted between each cam face and its springs so as to minimize wear. The shell is packed with grease, which keeps the parts well lubricated. The case is made grease tight. When the arms are caused to close up in proportion to the road inequality, the cam is turned and presses put on the springs which resist an amount dependent upon the degree to which the axle is raised.

Gabriel Rebound Snubber—This shock absorbing device, which remains practically unchanged for this year, utilizes the friction principle. It does not work on the downward movement of the springs, but acts upon the rebound. The application of the device to the car and the internal construction are shown in the illustration. The snubber consists of a circular base split into two semi-circular parts around which a strap of fabric belting is wound four times. One of the halves of the base is stationary and is integral with the clamp which fastens the device to the car frame by means of two set screws. The other half of the base is free to move and is pushed outward by a coiled spring. This outward motion is opposed by the windings of belting. When the frame and axle come closer together than normally, the strap slackens and the spring expands to take up this slack. The coils must slip over one another to do this. But on the rebound when there is a tendency for axle and frame to get farther apart the belt is pulled and the coils tighten, increasing the friction between them in proportion to the pull. Thus the resistance to rebound is in relation to the severity of the shock. The device comes in models for all sizes of pleasure cars and trucks.

Sager—The Sager company offers a specially designed type of equalizing springs which dampen the excessive vibration of the main springs, and it is claimed for them that they do not destroy the resiliency of these main springs in any way. They are wound with the largest coil in the center and taper to the ends. The spring and its attachment to the frame and the axle is shown in the cut. In addition to these auxiliary springs, the concern makes all styles of bumpers for attachment to the front springs. One of these models is seen in the illustration. It is made of steel tubing and is adjustable for width. Concealed springs within the brackets take any shock to which the front cross tube is subjected.

J-M—Replacing the spring shackles at the rear of the car, the J-M shock absorber, which takes its name from the initials of Jacquet Maurel, a French mechanical engineer, consists essentially of a helical spring within a cylinder, which spring is compressed according to the amount of shock. The illustration shows the construction and mounting at the end of a three-quarter elliptic spring. The lower flat laminated spring end carries the cylindrical guide for the helical spring by means of the U-bolt passing to the bottom of the cylinder. This cylinder bottom also forms the seat of the helical spring. The end of the upper flat spring fastens to the head or piston, which rests on the coiled spring. The action of the device is self-evident, and in addition to absorbing shock it acts as a shackle to take care of the elongation of the laminated springs. The device is made with two coiled springs, as shown, or with a single coil for small cars. The latest type to be brought out is the model which is designed for the peculiar rear springs of the Ford car. This is a single coil type and is mounted upside down as compared to its usual application.

Velvet—The Velvet shock absorbing springs also take the place of the rigid steel shackles of the rear ends of the flat springs. They are simply resilient shackles. The construction is seen in the sketch as well as the attachment to the main springs. Each set consists of two pairs of helical springs on which the car weight rests. These are housed within the rectangular metal cases shown. Steel studs around which the helical springs are placed fasten to the lower part of the laminated spring. These studs carry plates held in place by nuts on which plates the coiled springs rest. The sliding sleeves to which the end of the upper part of the flat spring is bolted rest on the coiled springs. Compression of the main springs acts to compress these auxiliaries also, causing them to act as absorbers. The velvet springs are made in five sizes for various weights of cars.

Flentje—The Flentje is a cylinder and piston type of shock preventing apparatus, and is made for attachment to the axle at one end and the car frame at the other. The sketch herewith gives the outward appearance of the device, which is on the dashpot principle, similar to that used in connection with the valve operation of the Corliss type of engine. The Flentje consists essentially of a piston working within a cylinder, the former being attached to the frame and the latter to the axle. The piston is drilled with several holes or

valves through which the mica and oil mixture, which fills the cylinder, may escape from above or below the piston depending on whether the piston is forced down or up. When a shock forces the piston down, it acts upon the liquid, which must escape through the piston holes, the resistance to flow increasing with the pressure exerted. When the spring recoil tends to draw the piston out of the cylinder the liquid is then above it and must be forced through the valves into the lower portion of the cylinder, the same fluid friction again acting as a compensating force against the recoil action. This is the principle of the device, although the details of the valves, etc., are somewhat complicated. The car weight is at all times suspended on the liquid cushion.

Westinghouse—The Westinghouse air spring, so called, is a device which is designed to be placed between the spring shackle and the frame. It consists essentially of two cylinders, one of which telescopes within the other. One of these is attached to the frame and the other to the spring shackle. Within the cylinders there is contained a volume of air normally at atmospheric pressure, and below this a certain quantity of oil. The lower cylinder is really a modification of the usual piston rod, and it carries a piston. The action of the device is similar to that of the dashpot. The car weight rests upon a fluid cushion, which consists of a quantity of air below which is the oil. Suitable valves are interposed which regulate the flow from the upper to the lower chamber or vice versa. After the air has been compressed a certain amount, the valves open and allow the oil to escape into the other chamber. Thus, when, due to the road inequalities, the axle is forced up nearer to the frame than normally, the tendency is to force the cylinders together. This serves to compress the air in to the top of the upper cylinder, the force being transmitted through the oil. When the air has been compressed somewhat, a valve opens, allowing it to escape into the lower chamber and permitting the oil to flow through the valves, the resistance to flow increasing with the pressure.

Ames—A new auxiliary spring shock absorbing device has appeared this year in the Ames, sketch of which is given. This spring is mounted directly on top of the lower main spring, and while it has no effect upon the resiliency of the main spring, it serves to smother the recoil vibrations. This device is a three-leaf affair, which bolts under the spring bolts, a metal block being interposed between the main spring and the oppositely-acting auxiliary leaves. When the main spring is normal, the ends of the longer leaf of the Ames spring are in contact with the upper leaf of the former. These leaves are not in engagement when the main spring is compressed, due to the use of the distance block. Thus the main spring vibrations are not imparted to the Ames device, which therefore tends to smother them when contact is again made on the recoil. The device is noteworthy for its simplicity.

Harking Back a Decade

FROM THE AUTOMOBILE for January 31, 1903:

So rapid is the progress of automobilism that principles which are laid down one day as established factors very soon become obsolete and have to be replaced by something more suitable to new and constantly changing requirements. Despite the wonderful development of the industry, it is far from having settled down on definite lines, and in striving at perfection manufacturers find themselves continually confronting new problems which lead them to unexpected issues.

In Pittsburgh there are 530 automobiles in use, of which 56 per cent, are used exclusively for pleasure parties, 40 per cent. for business and pleasure combined and 4 per cent. for commercial usage.

In 1759 Dr. Robinson, then a Glasgow student, talked about a wagon driven by steam and in 1772 Oliver Evans, of Philadelphia, actually did drive a wagon by steam, though the wagon was made for a boat, on the road, and in 1786 Evans tried to have the Pennsylvania Legislature give him a patent on steam wagons and did obtain a patent in that state on steam-driven flour mills and in 1787 the State of Maryland granted Evans an exclusive right to build steam wagons. Evans said then that he fully believed steam wagons to travel 15 miles an hour, or 300 miles in a day, and could carry passengers as well as goods; Most people thought Evans was crazy, of course.—Retrospect of the Steam Vehicle.

A novelty in after-dinner entertainments was sprung on the members of the Automobile Club of America and their guests on the occasion of the fourth annual dinner held at the Waldorf-Astoria recently. Between speeches a smart electric runabout came into the great banquet hall at a rate of speed that would have given a country constable palpitation of the heart.

"I don't claim that every man who runs an auto is a jackass, but I do claim that every jackass runs an auto. I run one myself."—Simeon Ford.

As a matter of fact, it is notorious that the drivers of horses are far more apt to be frightened than their beasts, and that when the horse takes fright it is commonly because he is notified by his sort of telepathy through the reins that the approaching object is to be feared. The driving public is in much more need of an education in this respect than the noble animal.—Editorial.

The feature of the annual report of the Secretary of Agriculture of Pennsylvania, John Hamilton, was the recommendation that $1,000,000 be appropriated for the construction and maintenance of concrete roads.

Express trains can dash across a public grade at the rate of 70 miles an hour and trolley cars can run at the rate of 30 miles an hour on a public highway for private gain, but an automobile, according to the government's idea, should not exceed 15 miles an hour.—New Jersey Drastic Law.

French visitors, of whom there were many, including well-known names among European manufacturers of cars and carriage bodies, must have been astonished at the vigorous prosecution of automobile designs not at all contenanced in their country.

Before the ladylike electric carriages of the various makes fair woman stepped with critical surveys of styles and upholstery, and the great improvement in design—mostly due to underslung batteries—probably did not escape them.

Descending to the level of male creatures, there is no more difficulty in picking out the centers of interest. They are grouped according to technical conviction, or perhaps more according to road experience, on the principle that he who paid full price for a spavined horse is likely to look out sharply for spavin, but, on the other hand, may be tripped again by weak kidneys or "thumps."

No doubt a large number of show visitors felt perfectly justified in declaring the cars here referred to the most interesting and promising in the whole display, especially as the Franklin and the Backus vehicles include a number of other highly original features, well worth studying. In the Backus car, for example, the ignition and the throttle are tied together for convenience in operation, but a special movement is introduced for increasing the dimensions of the valve parts, an accelerator, in other words—when full charges are required.

Magneto Field Well Stocked

Development Has Sought to Eliminate Vulnerable Points—Automatic and Fixed Control Gaining

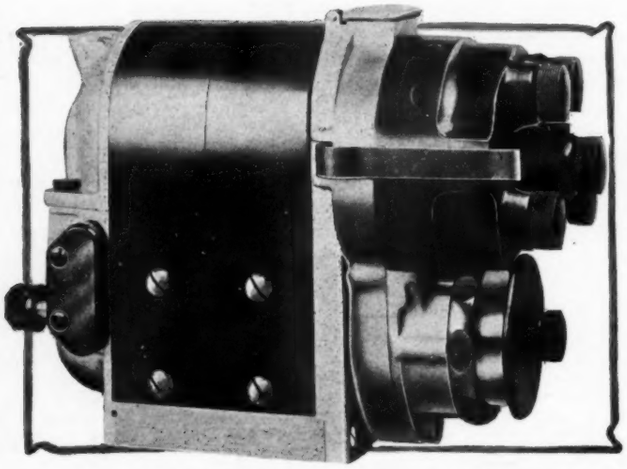


Fig. 1—The Bosch ZR 4 two-spark magneto which has a double distributer disk. The disk is held in position by two flat springs which have snap-on connection. The breaker-box cover has a bayonet lock catch, so that both of these parts are easily removable

SURVEYING the ignition field, development in general has sought to eliminate the vulnerable points, with the result that new types now appearing are a step further toward perfection. Radical changes are absent, but the big makers have tried to determine just where their instruments are weak, the principal aim being to eliminate the personal equation so far as possible in their manipulation.

Spark control has received considerable attention and in addition to the variable control, we now have fixed, automatic and governed methods of arriving at the proper time for exploding the several charges. The fixed-spark method has appeared on a number of cars, but its use is specially favored for trucks. For small motors this fixed ignition is well enough but it is doubtful if it is advantageous for large engines.

Automatic spark control is a system by which the spark is mechanically advanced or retarded, as the motor speed increases or decreases; while governed control is essentially the same as automatic up to a certain predetermined speed, above which the spark is not advanced further. This maximum point depends upon the motor in question.

Simplification of breaker box mechanisms by reducing the number of parts to the minimum is striven for with the result that the new instruments are much less liable to get out of order. Makers are also tending toward standardization of the parts which enter into the make-up of these breaker mechanisms, so that, where possible, the parts of all boxes are interchangeable.

The sturdier, lighter, more effective, more easily demountable and more readily attachable instrument of 1913 is in many cases also made water, dust and oilproof by the fitting of a protecting hood. This waterproofing is usually carried to the distributer connections as well. There is a general smoothing out of the devices, not only electrically, but also mechanically.

A few of the latest magnetos are provided with means for timing or setting without the removal of any of the parts. This is a specially desirable feature from the standpoint of repair, since it involves the time-saving element.

Several new schemes for intensifying the spark at low engine speeds, for use in starting have been produced to assist the cranking devices which are now in such profusion. A number of makers have also combined ignition with lighting in single units. To the ordinary lighting generator they have added a distributer and timer which take care of the ignition. The machine must then be driven in fixed relation to the speed of the engine, of course.

Bosch ZR Features Line

The Bosch standard types of magnetos are offered for 1913. The ZR series, which features the line and which was introduced 1 year ago, is being employed in those cars which heretofore used the D and DR types. The DU series retains its popularity, due to its special adaptability to engines of medium power. This type is supplied in either independent, dual, two independent or duplex systems.

The ZR magnetos—either as independent or two-spark ignition or in conjunction with battery systems, such as dual and two independent arrangements—are entirely inclosed, special packing being inserted between the magnets themselves and also between them and the end plates. By special arrangements, the cable connections are also made waterproof. The magneto being thus inclosed, any gear noise or that emanating from any other source is eliminated. The lubricant ducts are very accessible and are protected by suitable covers preventing the entrance of water and dust.

Fig. 1 shows the Bosch ZR4 two-spark type with double distributer disk. For ordinary purposes it is not necessary to remove the plug cables from the distributer, inasmuch as the disk can be easily detached for inspection of the rotating carbon or for cleaning of the segments. The disk is held in position by two strong, flat springs which have a snap-on connection, as shown. The timing-lever casing which carries the interrupter segments is fastened by a bayonet catch, a quarter turn of this casing allowing it to be removed without the use of tools so that the interrupter can be examined. The timing-control arm is no longer a part of the breaker-box casing, but is a separate piece in itself. A lug on its inner circumference is made to fit into any one of a number of evenly-spaced slots around the periphery of the breaker-box housing. The arm can therefore be fixed in any position about the interrupter casing, thereby greatly facilitating the connecting of the advance and retard mechanism of the car. Fig. 4 shows the interrupter mechanism of the ZR4 dual instrument. The interrupter lever is shown at B and the platinum contact points at C.

In the ZR types, the special toothed pole pieces, Fig. 14, are used, making it possible to produce a spark at low speeds or at any position of the advance lever. For the timing of these magnetos in relation to the motor, a method has been devised which makes it unnecessary to remove any of the parts. To set the older types, the distributer disk and dust cover of the interrupter housing must be removed. This new feature is shown in Fig. 3. Above the distributer gear there is a window through which the gear teeth may be seen. One of these teeth is marked while the edges of the window are also marked for reference. There is a second window in the face of the distributer plate through which the numeral 1 appears when the armature is revolved. In setting the magneto, the crankshaft is first turned until piston No. 1 is in full advance firing position, after which

the magneto armature is revolved until figure 1 appears in the distributer window. The marked tooth will then be close to the upper window marks and should be turned until there is exact register between them. Distributer terminal 1 is then connected to cylinder No. 1 and the other wires connected in accordance with the firing order. The gear is then fastened in position and is now timed for full advance position.

The Bosch ZR types correspond in their principal dimensions with the DR models, so that one magneto may be substituted for the other in the same space. The ZR is made for both four and six-cylinder installations.

Eisemann Has New Low-Tension

In the list of Eisemann products for 1913 appears a new model low-tension magneto, type EB. With this instrument a separate coil is used to transform the current to high tension. All the special Eisemann features are incorporated in the new machine. The contact breaker and its cover and the front view of this type are seen in Fig. 2. The breaker mechanism is extremely simple, consisting of the ordinary platinum points held in contact by a flat spring. The points are pulled apart to break the circuit by a cam mounted on the magneto shaft, which cam bears on a follower connected to the flat spring.

The EM type magnetos for one, two, three, four and six cylinders are continued without change for both dual and single ignition of the direct high-tension variety. Models EA, EU and ED, in both manual and automatic spark control, are the products of the Stuttgart, Germany, factory of the Eisemann company. The principal importations of these models are of the automatic control design. This control is of the centrifugal-governor type and makes use of a cage which is rigidly mounted on an extension of the armature shaft. Within this cage there is a rectangular sliding block which is drilled and threaded to pass over the helically-cut driving shaft of the magneto. Governor balls are attached to the block through linkage, which fly out an amount proportional to the shaft speed. This causes the block to travel along the shaft, and to so move, the block must then rotate slightly, carrying with it the cage and thus advancing the armature with reference to the pole pieces. The opposite operation takes place when the speed falls off and the governor balls fall inward. To apply the automatic control to any motor the double shaft thread is made in varying pitches so as to give varying degrees of advance. By using a spring of varying tensions and lengths for acting against the centrifugal motion of the governor balls, any desired advance curve is possible.

In connection with these automatic spark control magnetos is the provision for setting the armature in relation to the crankshaft. The governor casing is slotted for the reception of a key which will fit into place only when the armature is in such a position that the breaker points are just about to part. The insertion of this key holds the cage stationary while the setting is made.

Numbered among the Eisemann products are also the low and high-tension types for slow-running stationary engines and the like. All Eisemann magnetos are constructed with the specially designed pole shoes which are pointed at the center of their length and so shaped that the extended portion is approximately in the plane of the theoretical axis of the armature core. The magnetic lines of force are thus concentrated, increasing the volume and intensity of the spark at the break.

Splitdorf Four New Magnetos

A new series of four magnetos has been brought out by Splitdorf. These are models W, X, Y, Z, all of which are of the low-tension type, which method of ignition has characterized the Splitdorf products for some time. The newcomers bear some of the familiar earmarks of Splitdorfs of the past, but they are refined in details to meet the growing demand for sturdy, light and effective mechanisms. The newcomers are compact and smooth in appearance and have vertical distributer blocks.

Model X is designed for use on all of the standard four-

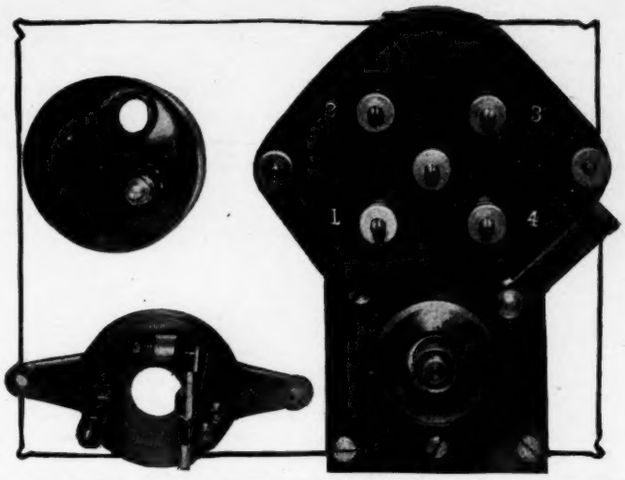


Fig. 2—The Eisemann type EB low-tension magneto arranged for four cylinders. The contact breaker and its cover are shown removed. The breaker mechanism is very simple

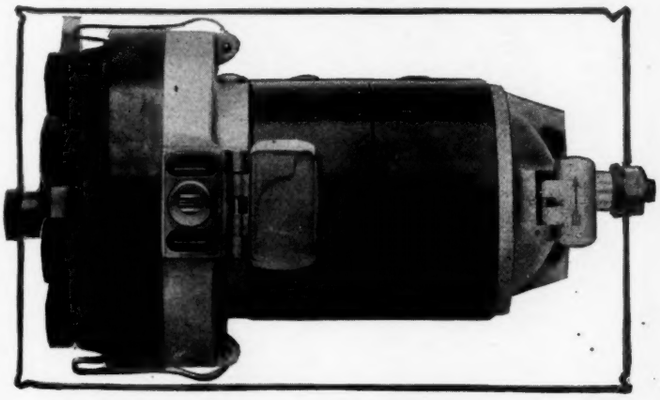


Fig. 3—Top view of the Bosch ZR6 magneto, showing the window through which the marked distributer tooth appears and the registering marks on the edges of the opening. At either side of the window is an oil hole. All three openings are covered

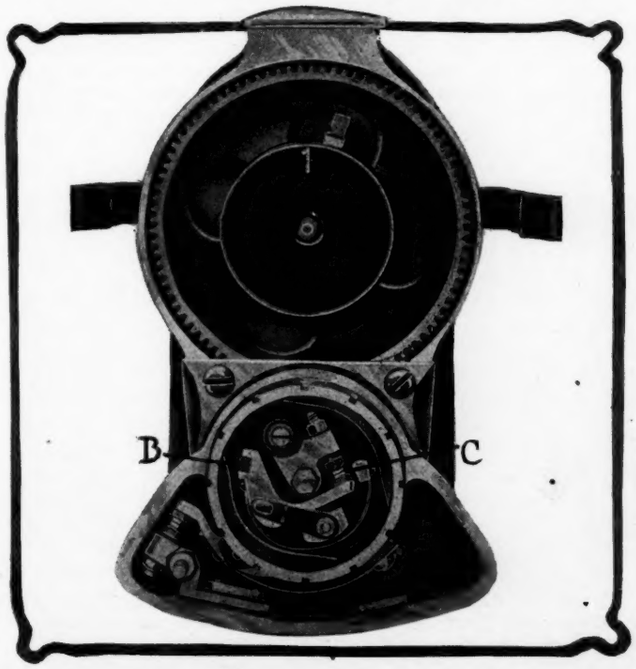


Fig. 4—Front view of the Bosch ZR4 dual magneto. The distributer and breaker housings have been removed. The interrupter lever is at B, while the platinum contact points are at C

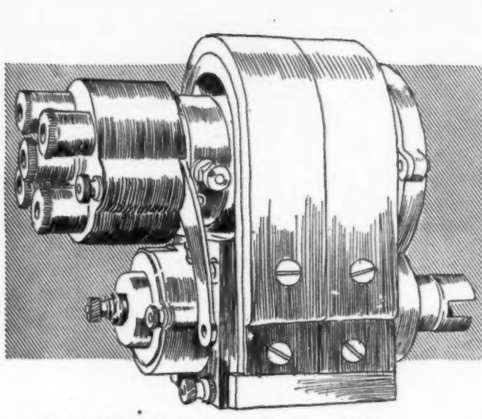


Fig. 5—The National type C4 which is used in connection with a double system and a transformer coil. A condenser is incorporated in the magneto

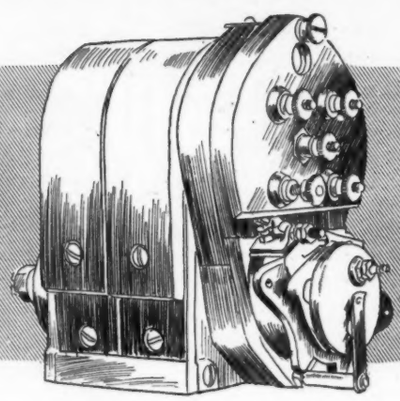


Fig. 6—Eisemann type EM four-cylinder magneto which is a dual direct high tension type. It uses the Eisemann center-pointed pole pieces

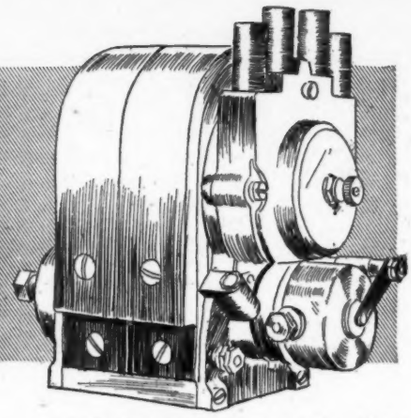


Fig. 7—The Splitdorf model X, which is designed for use on any of the standard four-cylinder motors. This is one of the four new low-tension Splitdorfs

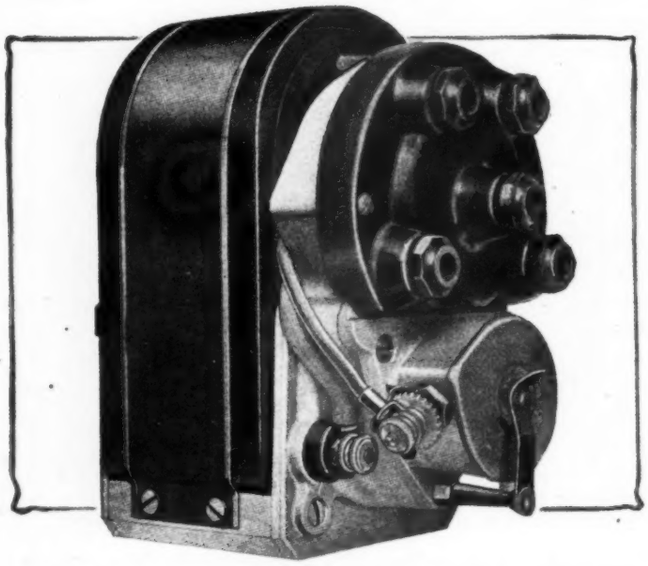


Fig. 8—The latest Remy type, model RL, which is a two double magnet machine operating on the inductor principle common to all Remys. This machine supersedes all types of this make. There are no moving contacts or windings in the inductor construction, the current being set up in stationary coils placed in the magnetic field

cylinder motors, while model Y, which is of the same general dimensions as the former, is made for the operation of any of the six-cylinder engines on the market. Both of these types are of the two-pair magnet design. Models W and Z are of the three-pair magnet variety and are constructed for use with heavy, slow-speed motors of four and six cylinders respectively.

The armature connection on each of these new models has been placed in the back plate of the instrument instead of being located at the front of the breaker box as formerly. The details of the breaker-box mechanism have been altered somewhat with the view of bringing about a greater degree of efficiency. One large contact brush replaces the two formerly used, thus insuring a better wiping contact with the armature. The breaker-box spring pillar has been lifted from the line of the base to a point above the breaker box. All breaker box parts in this series have been made interchangeable throughout and all have taper shafts of the same taper. The S. A. E. standard magneto dimensions have been adhered to in the design of these new instruments.

Along with its new magnetos Splitdorf has brought out a new vibrating coil known as model TS, which presents a durable and compact appearance. It is designed to extend through the dash and is inclosed in a water tight case effectively protecting the wire terminals. These are numbered for easy wiring reference. The coil proper is mounted on the base of the switch, which is provided with an ignition button for use in starting the car on battery. A lock is incorporated to prevent any of the switch operations.

Remy RL Retains Inductor Design

Remy has a new model, known as RL, which is provided with a waterproof distributer. It is a two-double magnet machine. Like former instruments of this make, it has a stationary winding, being of the inductor type. The only moving parts are the inductor shaft and inductors, between which the winding is placed. This winding is of coarse wire in which the current is set up and thence passed to the terminals. Besides being between the two inductor segments, the winding is housed on the sides by the pole pieces. Thus when the parts are all assembled it is completely protected. The principal advantage claimed for this inductor arrangement is the absence of moving wires and contacts.

The inductor segments are balanced for best efficiency mechanically, this balancing relieving undue strains on the shaft and bearings. The new RL models also have a timing push button for simplicity in installation. This button is located at the top of the distributer and connects with a small plunger. There is a small recess in the distributer gear which, when in register with the push-button plunger, locates a segment opposite a marked terminal on the distributer cover. The magneto is also so inclosed as to be waterproof. This new RL type is shown in Fig. 8.

New Mea Armature is Rocked

Mea has introduced a model which differs radically from standard construction of its make in that it does not involve the feature of rocking horizontal field magnets. This new model is waterproof, which result is accomplished by entirely covering the whole upper part of the instrument in a metal housing. The connections are so fitted that there is no possibility of water entering the housing to do damage to the armature or the contact features. The only portions protruding from the case are the driving gear, the terminals and the arm by which the spark is advanced or retarded by revolving the armature within the fields. By insulating the terminal plate in which the holes for the leads to the spark-plugs are drilled at an angle, protection is afforded for the high-tension terminals. Vertical holes in the top of the terminal plate take the connecting studs, the heads of which are beveled to close the holes. Instead of rocking the field magnets as in other types of Mea devices, this newer design accomplishes the same result by reversing the operation, keeping the field stationary and rocking the armature on its shaft. This permits of the housed character of the instrument.

In the ordinary Mea construction which has held exclusively up to this year, the instrument makes use of a bell-shaped magnet mounted horizontally on an axis so that it can be revolved through a certain angle around the armature. See Fig. 9. This magnet is so suspended as to be balanced in any position so as to be readily adjustable for any timing position. The idea of the peculiar bell-shaped magnets is that the armature receives full benefit of the magnetic field, being located so as to be in the path of the greatest number of lines of force. This makes for intensity of spark and permits of the production of an igniting spark when the motor is turned over slowly.

Simms Offers Two Models

The American Simms magnetos for this year are styled SU types, and are furnished in two models—independent and dual—for both four and six-cylinder motors. They are all of the high-tension, two-magnet design, in which the high-tension current is generated in the double winding on the armature. The independent magneto, with which no batteries are used, is intended for motors up to 5 inches bore, while the dual type provides a battery system of ignition in connection with the magneto ignition. The SU independent magneto for four-cylinders may be had with fixed spark if desired. In this case it is fitted with a stationary cam ring. But unless otherwise specified, this magneto comes with a timing lever permitting a timing range of 30 degrees. The dual system is so arranged as to give a vibrating battery spark for starting. It is said that this vibrating spark will fire a cold mixture.

When fitting these magnetos to the engine, the timing and setting is facilitated by a window in the distributer board in which the figure 1, which is marked on the distributer gear, appears when the distributer arm is making contact with the segment corresponding to cylinder No. 1. The distributer is water and dustproof. The distinctive Simms pole shoes are among the principal features of this design. They are notched on diagonally oposite ends, as shown in Fig. 13. This notching serves to concentrate the lines of force at the edges of the notches, making for a hot spark at the break. This spark is equally as intense in any position of advance or retard. These special pole shoes are fitted to both duals and independents, although the fixed-spark machines employ the ordinary straight form of shoes instead.

Both independents and duals are of the same general construction, the only difference being the addition of the commutator on the dual and the substitution on it, also of the dual contact breaker for the independent breaker. This commutator or battery timer on the dual is a new design and consists of a shell of condensite into which are moulded four bronze segments, Fig. 10. Two of these are connected to the commutator terminals, while the other two simply serve as a path for the contact breaker brushes and assure even wear of the commutator, which is fitted to the timing lever in place of the dust cover of the independent type, and held in position by a flat spring.

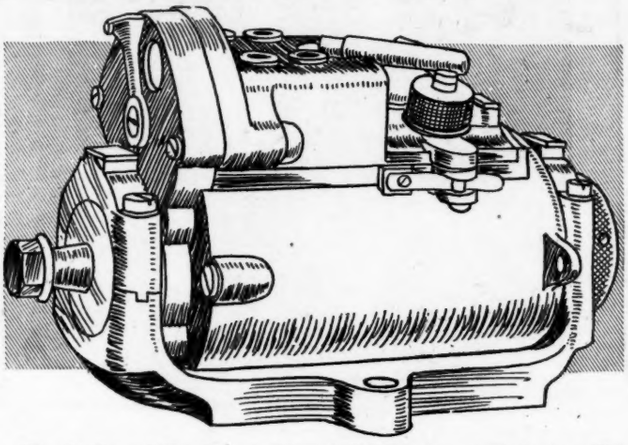


Fig. 9—One of the Mea rocking, bell-shaped magnet types. The field magnet is mounted horizontally on the same axis with the armature, causing it to get full benefit of the lines of force

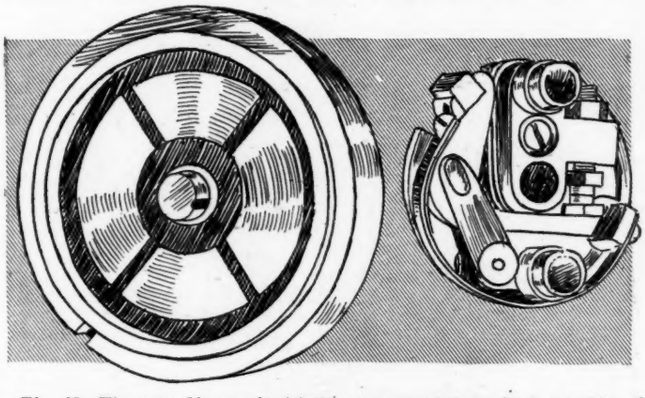


Fig. 10—The new Simms dual battery commutator which consists of a condensite shell into which are molded four bronze segments

Fig. 11—Simms dual contact breaker, showing the substantial contact arm and platinum points of ample size

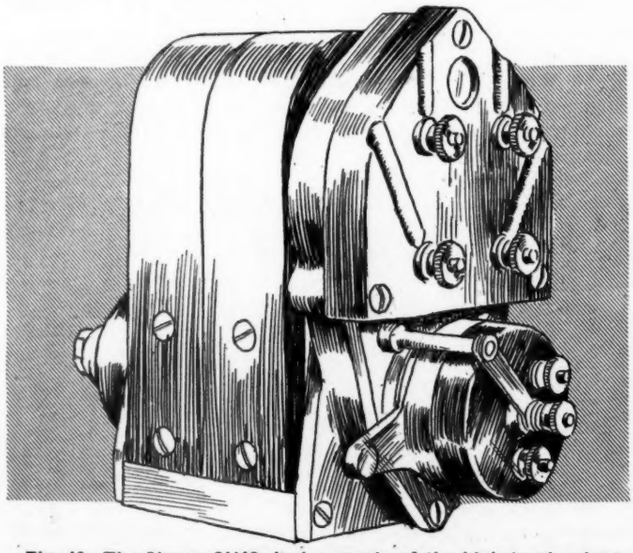
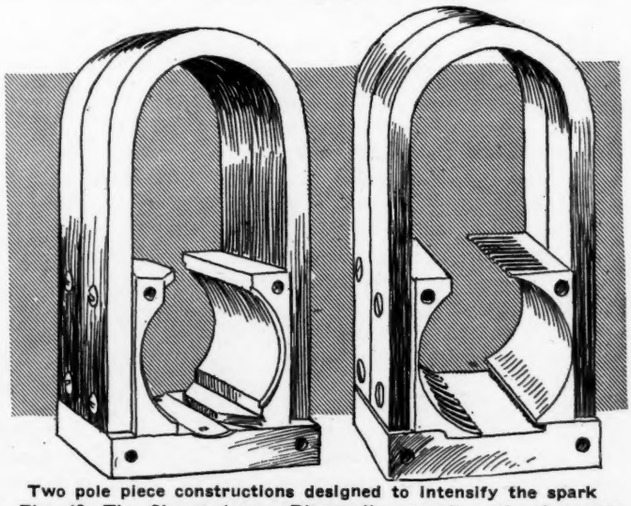


Fig. 12—The Simms SU4S dual magneto of the high-tension type. The window in the top of the distributer board to facilitate timing is shown. When the figure 1 appears it indicates that the distributer arm is making contact with segment number 1



Two pole piece constructions designed to intensify the spark

Fig. 13—The Simms type. Diagonally opposite pole shoes are notched back from the ends, concentrating the lines of force at the extreme pole ends and producing an intensified spark

Fig. 14—The Bosch toothed pole pieces which serve to concentrate the magnetic lines at the ends of the teeth

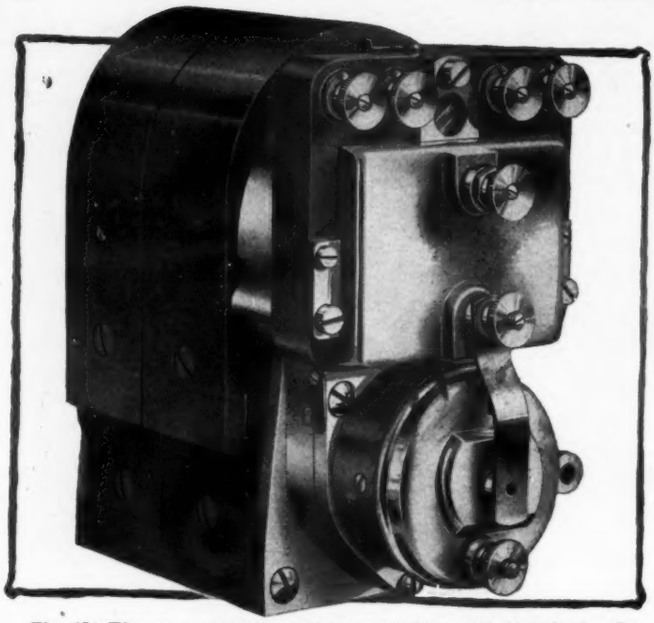


Fig. 15—The new magneto used in connection with the Hi-Fre-Co ignition system brought out by the Dean Electric Company. This instrument is a dual type and has the condenser mounted on the front of the distributer. The instrument is a low-tension device, the voltage being stepped up at the plugs

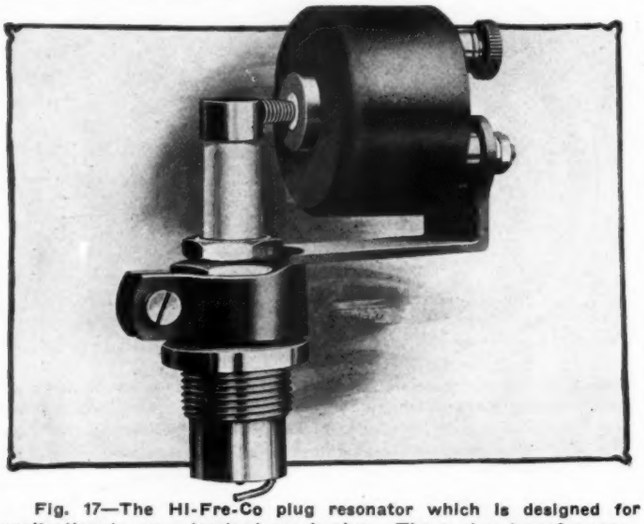


Fig. 17—The Hi-Fre-Co plug resonator which is designed for application to any standard spark plug. These plug transformers are used to step-up the voltage directly at the point of use so that there is no high tension wiring leading to the plugs

Westinghouse Regenerative System

After several years of experimentation the Westinghouse concern has finally placed upon the market a combination lighting and ignition system, the single generating unit, Fig. 21, forming the basis of the arrangement. This system is regenerative, that is, when the engine is not operating or when it is running at very low speed, power for ignition and lights is furnished by the battery and returned to it when the car is running at all usual speeds and at high speeds. The features of this system which apply to car lighting will be covered in connection with an article on electric light systems.

The ignition features consist principally of a dual system and automatic spark advance. Fig. 18 shows the interrupter and automatic advance mechanism. This interrupter or breaker has two series contacts, seen at the lower center. The sketch shows the position of the interlocking spark advance mechanism at high speed. The two metal segments or cams, which operate the breaker mechanism, fly out from their normal position an amount proportional to the speed. Thus they advance the time

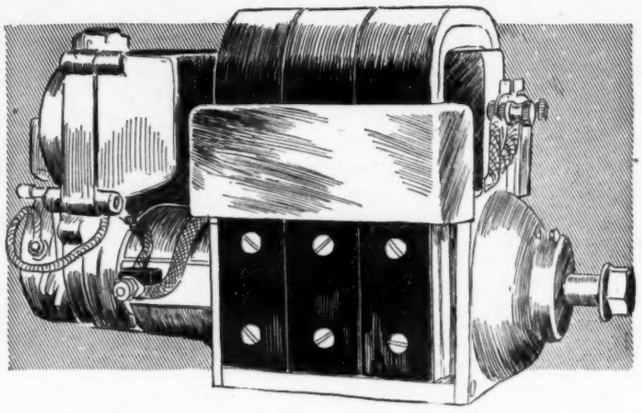


Fig. 16—The Deaco combination ignition and lighting generator, showing the mounting of the distributer and circuit breaker at the front end. Though combined in one unit, a special grounding feature entirely separates the ignition and the lighting circuits

of break in proportion to their position. This automatic centrifugal device adjusts the spark advance to all speeds, keeps the period of contact nearly constant at all speeds and prevents by its design any inequality between the two interruptions that occur in succession during each revolution. The distributer is of the ordinary magneto type and is detachable without interfering with the contact brush. Provision is made with this system for the manual operation of the spark if desired in addition to the automatic control. In this case the spark lever need only be used for the original adjustment and may then be locked in position. Running variations in spark are taken care of by the control. Since this instrument is primarily a generator, it may be had without the ignition parts and coil if desired.

Two Western Electric-Pittsfields

The Western Electric Company, which recently took over the Pittsfield Spark Coil Company, offers two types of magnetos for this year. These are type F, which is a fixed spark instrument, and type N, which is provided with variable spark. The magnetos themselves remain practically as they were, but a new dual system uses in addition to the magneto removable unit spark coils for the battery side. For starting purposes this dual system is supplied with a push-button switch, which throws two sets of dry cells in series, doubling the primary voltage. At the same time the current is automatically sent through a vibrating coil, making the starting spark of high intensity and long duration.

The Western Electric-Pittsfields are of the high-tension induction type. That is, the current is generated in a stationary winding within the field of the magneto. There are no moving contacts or windings. The armature which carries two iron segments but no winding is the only revolving part. Instead of placing the stationary winding between the rotor segments as in several other inductor types, the Pittsfield practice is to place it at the rear of the instrument, Fig. 20. This illustration depicts the variable spark model N. In outward appearance and general construction the two types are the same, differing only in internal construction. There are four poles in the magnetic field, two of which are the poles of the permanent magnets, while the other two with the iron core compose the field.

Deaco Has Combined System

The Detroit Electric Appliance Company makes a combination ignition and lighting system which remains practically the same as last year. While primarily a generator, the electrical unit is adaptable to the addition of distributer and circuit breaker so as to take care of ignition as well. The Deaco generator is treated in this week's installment of an article on starters running serially in THE AUTOMOBILE. Though combined in the one unit, the ignition and lighting systems are entirely separate and

operate independently of one another. The distributer gear is carried at the rear and meshes with the armature gear. These are housed by the rear end plate. The distributer is fastened to the gear and carries the carbon brushes which distribute the high-tension current and make contact to the coil, which together with the condenser is fastened in a housing against the distributer block. The interrupter is fastened to the rear end plate by a retaining spring. No pole of the generator, battery or interrupter is directly grounded, a grounding scheme being used which causes both ignition and lighting systems to perform their functions independently of each other.

Briggs High-Tension Unchanged

Briggs model C magnetos are continued practically as heretofore, although slight changes in the finish are to be noted. This magneto is designed for dual ignition for four and six-cylinder motors. It is a high-tension type and provided with two magnets. The breaker-box mechanism and the distributer parts are inclosed within a cover plate which is easily removable for inspection. In this magneto an oil tank is placed in the arch of the magnets, which has a capacity of 6 ounces of lubricant. The oil feeds automatically to the bearings from this small tank. The circuit-breaker mechanism is of simple form and has the usual platinum contact points. The distributer is constructed of hard rubber. For automatic spark control a centrifugal governor is provided. The breaker for this mechanism is fixed in relation to the armature at the point of best efficiency. The governor acts to advance the spark according as the motor speed increases, and vice versa. In addition to magnetos, the Briggs products include a combination lighting and ignition outfit and a lighting and starting system.

Atwater-Kent K Unisparker New

In addition to its standard type F Unisparker system of ignition the Atwater Kent concern is now furnishing a new model, known as type K, which has automatic spark advance and an insulated primary circuit, designed especially for use in connection with lighting and starting equipment. The automatic spark governor is of the centrifugal type, the amount of advance depending on the deflection from their normal position of the metal segments which take the place of balls. The outward motion of the segments is opposed by springs. The principle of the sparker is the transforming of the low voltage sent to the sparker from the battery into high-voltage electrical energy, which is then distributed to the spark-plugs in the usual way. Fig. 19 shows the type F Unisparker, which is furnished for any number of cylinders up to six. The type K system is made for two, three, four and six cylinders.

Hi-Fre-Co Uses Step-Up Plugs

The Dean Electric Company has developed a system which gets its name from the high-frequency oscillatory discharge at the spark points. The magneto used is of the conventional type, Fig. 15, while there is a separate resonator coil mounted on each spark-plug, as shown in Fig. 17. These plugs may be of any standard type. The resonators are used to step up the voltage of the high-frequency current directly at the plugs so that all of the wiring to the resonators can be of low voltage. The coil winding is imbedded in a special insulating material which will withstand heat, oil and water and which is durable. The system combines a dual arrangement by means of which a combined dash coil and switch is employed utilizing battery current instead of magneto. In connection with each of the spark coils there is a small condenser for intensifying the oscillatory discharge. The frequency of this is given at from 500,000 to 1,000,000 oscillations per second. The magneto is a two-pair type having distributer and breaker box at the forward end. The magneto differs slightly from other conventional types in that the armature has one winding of comparatively coarse wire. The condenser is mounted on the front of the distributer. This distributer and all electrical circuit portions of the instrument carry low voltages.

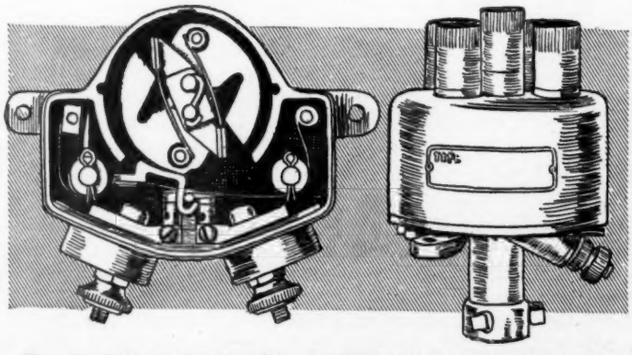


Fig. 18—Sketch showing the position of the Westinghouse centrifugal automatic interlocking spark advance mechanism at high speed

Fig. 19—The type F Atwater-Kent Unisparker, a combined transformer and distributer which steps-up the low battery voltage before sending the current to the plugs

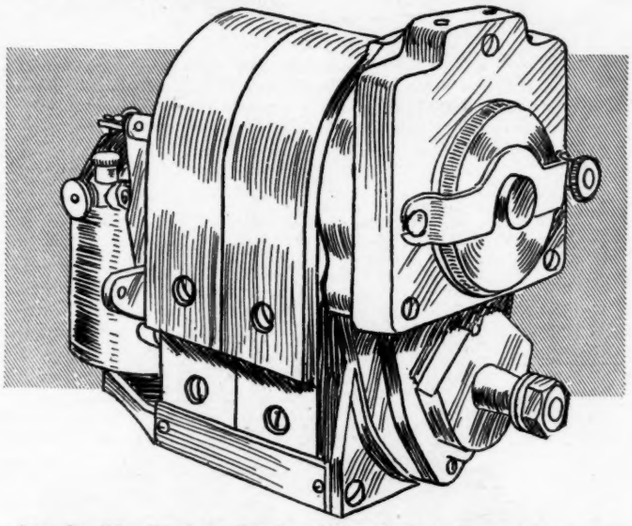


Fig. 20—The Western Electric-Pittsfield type N variable spark instrument. It is a high-tension inductor type, the winding in which the current is set up being stationary and placed at the rear of the machine as shown. Type F which has fixed spark is similar to this in outward appearance

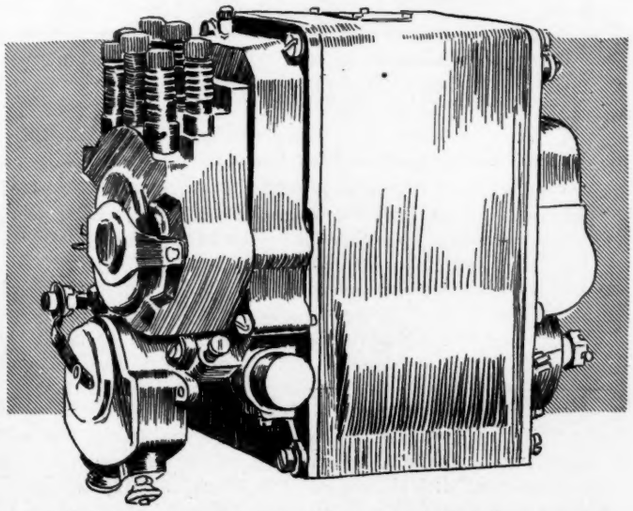


Fig. 21—The Westinghouse combined generator and magneto which is used in connection with a regenerative system. The magneto portion of the apparatus has automatic spark advance and it is of dual type. The generator has an electro-magnetic and not a permanent magnetic field. The entire front plate carrying breaker and distributer is removable

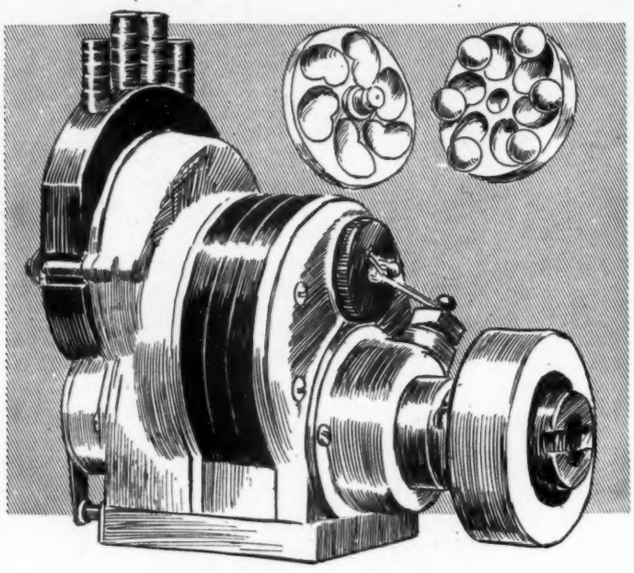


Fig. 22—A Herz magneto equipped with the Herz centrifugal automatic timing adjustment. In the upper corner are shown the two disks in which are cut six grooves for the insertion of balls, which act as governor weights and twist the armature in proportion to the speed

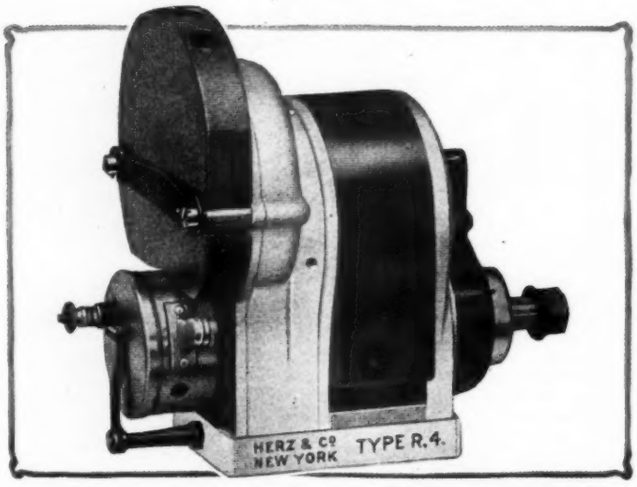


Fig. 23—The latest Herz model type R4 which is a fully inclosed high-tension type. The magneto makes use of double U-shaped magnets in place of the round flat variety

Connecticut Magnetos Not Changed

Connecticut magnetos remain practically as heretofore, although an igniter has been added to the line. This is really a transformer coil which steps up the battery voltage sent to the ignition point. The Connecticut magneto is completely housed and is made for either independent or dual ignition. To facilitate timing, an indicating arrow is placed on the rear of the housing, together with proper reference marks on the armature shaft. The distributer and breaker box are carried at the front end.

K-W Has New Low-Tension

K-W magnetos are of the inductor type, having no moving windings. The rotor or armature carries two segments which are mounted with their axes at right angles. The windings are fixed between these rotors in the center of the magnetic field and the cutting of the lines of force passing between the magnetic poles induces a current in the windings which current passes to the terminals at the front of the instrument. The K-W types are made with three, four and five magnets in both high and low-tension models. The largest high-tension type of this make is shown in Fig. 26. This is model HT, which is designed for the largest engines without the use of starting batteries. The complete line includes, in addition to this model, the model J, a three-magnet instrument for medium-size motors, and model H four-magnet type, for large engines. These are all high-tension types. In the low-tension class are models A, E, M, D and U, which are all of the four-magnet design and differ in the method of mounting and drive. The latest of these low-tension designs to be brought out is the three-magnet machine, model LS. All these low-tension instruments may be used for lighting purposes.

National Uses Double System

The National Coil Company is producing a double ignition system, which makes use of the National type C-4 magneto and on the battery side operates with either five dry cells or a 6-volt storage battery. Fig. 5 shows the C-4 instrument, which is a two-pair magnet machine, and which carries distributer and breaker-box mechanism at its front end. This double system uses a transformer coil which is designed to be mounted near the magneto to avoid long runs of cable. The magneto carries the condenser and it is also provided with a self-oiling system with a reservoir holding .25 ounce of lubricant. At the drive end there is a timing dial for facilitating magneto setting.

Briggs and Stratton Is Complete

The Briggs & Stratton igniter is the combination of a spark coil, distributer and contact maker within a single unit. The system works with either a 6-volt storage battery or six dry cells, and operates to transform the low voltage from this electric source into high-tension current, which is then sent to the cylinder in which the charge is ready for firing.

Rhoades Improved in Details

The Rhoades ignition system has been refined and a type has been brought out for use on cars which have lighting and starting systems of the electric design. This new igniter is entirely insulated from the ground by making the shaft in two sections insulated from each other by a fiber bushing. Other changes have been in the utilization of a round coil and the addition of a small condenser which eliminates sparking at the breaker points. Another improvement is in the use of weatherproof terminals which are so constructed as to permit of the attachment of the wires without solder or tools. The general appearance of the instrument remains the same.

Herz New R4 Has U Magnets

The latest Herz model is known as type R4, which is a fully inclosed high-tension device. It has double U-shaped magnets which are exactly ground to fit together within an aluminum housing. The instrument is waterproof, distributer and breaker mechanisms being completely inclosed. The secondary connections are all well insulated and also protected against dust and water. The apparatus is small and light in weight.

The Herz centrifugal automatic timing adjustment is continued in an improved form. It consists essentially of two mating disks, Fig. 22, which are placed between the magneto shaft and the main magneto driveshaft. Each of these disks has cut in it six curved grooves which when mated form chambers in which are placed balls, one to a pair of grooves. These balls being free to run in these combined grooves act the same as governor weights and fly out from their innermost positions an amount proportional to the speed, imparting a twist to the armature and thus advancing the ignition a corresponding amount of its total range of 40 degrees.

Kingston Condenser in Magneto

For automobile ignition, the model B Kingston is the principal type made by the Kokomo Electric Company. This magneto is a two-pair, high-tension type, in which the principal change for the year is the incorporation of the condenser within the magneto, whereas it was formerly located with the spark coil. This

change is made necessary due to the replacing of the box type of coil by a tubular design which is placed back of the dash, the switch plate to which it is attached being flush with the dash. However, the ordinary box coil carrying the condenser and the magneto without condenser may be had if desired. The magneto is inclosed so as to be impervious to water, oil and dust.

Another Kingston instrument is the model D, which is the same in construction as model B except that it has three pairs of magnets and is generally used on heavy, slow-running engines. Single-cylinder magnetos and make-and-break types are also made. The combining of condenser with magneto is also optional in the case of model D.

Heinz Has Circular Magnets

The Heinz magneto is of the compound-armature type, so that no outside coil is needed. The magnets are of the circular type which is a characteristic feature of the instrument. This year both of the primary winding ends are grounded, whereas formerly only one of them was so connected. The instrument is made for use with either four or six-cylinder engines.

Motsinger Is Driven by Friction

The Motsinger direct-current magneto is really a small electric generator designed for use without batteries. It is made to operate with any make-and-break coil and is intended to be driven by friction connection with the flywheel face. A sketch of the instrument is given in Fig. 24. The poles are made up of fourteen laminations, which are bolted together. To keep the speed and output of the instrument constant, it is equipped with a centrifugal governor which varies the engagement of the friction wheel with the flywheel according to the motor speed.

Holtzer-Cabot Friction Types

The Holtzer-Cabot Electric Company makes several types of low-tension magnetos to be driven through friction pulleys with flywheel face engagement. These are usually fitted with centrifugal governors for keeping the driving speed constant. The magnets used with these instruments are thinner than the conventional type, while the armatures are laminated.

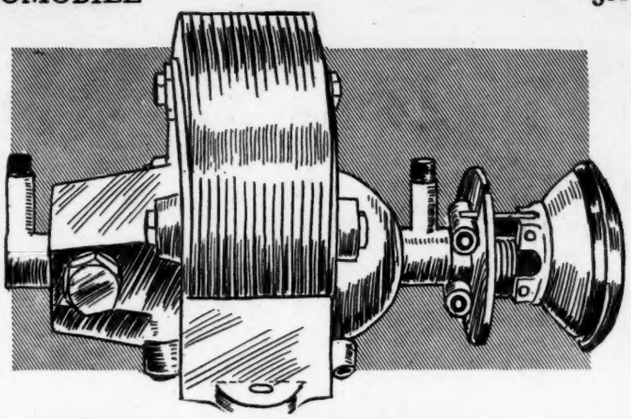


Fig. 24—The Motsinger direct current magneto which is of the low-tension type designed to be driven by friction pulley from the flywheel face. The poles consist of fourteen laminations bolted together as shown. It is fitted with a centrifugal governor to keep the speed and output constant

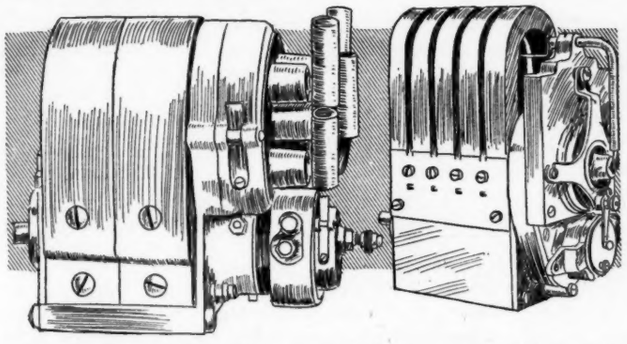


Fig. 25—The two-pair Kingston model B magneto, which is of the dual type. The condenser is incorporated within the machine in its latest refinement

Fig. 26—The K-W five-magnet machine, HT, for large engines. This make of magneto is of the inductor type, there being no moving contacts or windings

Year's Progress in Vulcanizers

Among the new vulcanizers on the market is the Shaler Vulkit. It consists of a cylindrical metal pot with a flat bottom inside of which there is a smaller cylinder, with a pointer in the center. The inner cylinder is covered with a removable lid around which is wound an asbestos fabric. Gasoline is poured into the inner receptacle and on to the asbestos fabric and the whole body clamped into position over the inner tube to be vulcanized. A suitable clamp is supplied by the tool. The gasoline being lighted sufficient heat is generated to vulcanize the tube, which is prepared beforehand in the usual manner for such work. The outfit is manufactured by C. A. Shaler, Waupun, Wis. In addition to the Vulkit, the company continues its regular line of electric and steam-heated vulcanizers for use by motorists and garages in mending tubes and casings.

For those who have electric light in their houses and garages the Gibney Eleck-Trick vulcanizer is a useful repair outfit. It is constructed of nickel-plated cast-steel body with a heat-resisting handle. A concealed coil is arranged inside the instrument to give the necessary heat, the temperature being automatically maintained at the proper degree for vulcanizing by means of a thermostat which forms part of the instrument. With it tubes and casings can be repaired. The outfit consists of the vulcanizer with 10 feet of cord, with plug for lamp socket, asbestos pad, clamp and the necessary tools and repair materials. In addition to the Eleck-Trick, James L. Gibney Rubber Company, of Philadelphia, also makes the Gibney rheostat and Gibney steam vulcanizer. These instruments resemble that of the Eleck-Trick, but in the case of the rheostat the temperature can be controlled to the required degree by means of a rheostat and in the case of the steam vulcanizer the heat is furnished by an alcohol fire pot and controled by an adjustable ventilator.

The B'Co. gasoline vulcanizer, manufactured by the Brown Company of Syracuse, N. Y., consists of a small oblong metal receptacle with a concave base and provided with a chain for use with outer casings to hold the vulcanizer in position and a flat base for inner tubes, slightly convex on one side to follow the contour of the base. The inside of the main body of the vulcanizer is hollow and has several small verticals cast integral, the heads of which are slightly larger than the main body. A measuring cup is supplied to determine the correct amount of gasoline to use.

The National vulcanizer manufactured by the National Motor Supply Company, Cleveland, O., is an instrument upon which the side of the tread of an outer casing can be repaired, or three inner tubes can be repaired at the same time. The main body of the machine forms a water chest below which there is a gas heater. A steam gauge denotes the amount of pressure which can be regulated by a safety valve. When it is desired to use gasoline for heating purposes a special heater and tank are provided for a small extra charge. However, the gas equipment will meet all requirements.

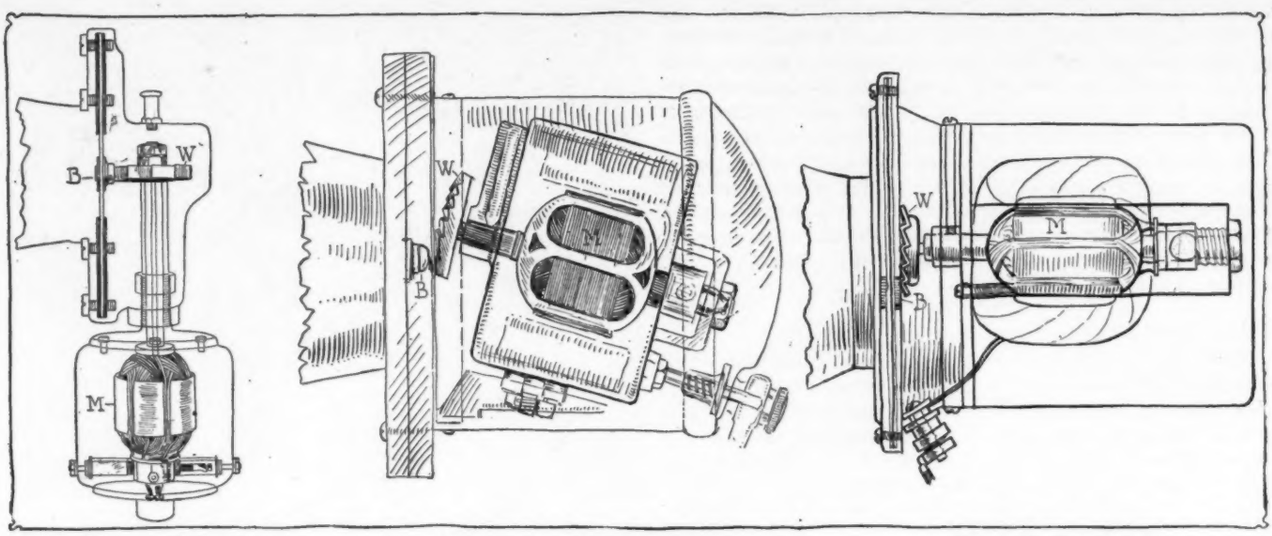


Fig. 1—Klaxon electrical signal Fig. 2—Klaxonet medium-sized signal Fig. 3—Klaxet small horn

Automobile Signals

¶ In the following review of 1913 warning signals for motor cars, THE AUTOMOBILE gives a statement of the situation by illustrating the new types of horns which this year's market affords, as well as the improvement made in the devices continued from 1912. The trend pointed out by these examples is toward small, electric signals of effective sound and comfortable operation of the horn from the steering wheel.

THE past year has been a period of fruitful activity so far as the manufacture of sound signal for automobiles is concerned. Besides most of the manufacturers who were in the field a year ago, a number of firms which have not made horns heretofore have exhibited this line of products at the national shows. Outside of these makers, however, there are a great number who did not show their goods at all either at the Garden or the Palace.

The trend in the horn line is toward the electric signal. As a proof of this statement it is only necessary to compare the number of electric horns now on the market as compared with what it was 2 years ago. To be sure, the exhaust horn is holding its own, but as manufacturers drop the making of bulb horns, the majority turns to the manufacture of electric signals rather than to the exhaust type. The explanation is probably that the installation and care of an electric horn is certainly as simple as that of the exhaust signal and the operation is easier. There can hardly be any argument as to the great ease with which an electric horn is operated by pressing a button on the steering wheel; it may be just as little work to press a pedal operating an exhaust horn, but it seems that automobilists feel that their feet are already attending to enough pedals.

That manufacturers of exhaust horns recognize the truth of this situation, is shown by the example of one which now brings out a push-button operated exhaust horn, while another company has practically dropped the manufacture of the pedal-operated horn, and now uses a bulb on the steering wheel, to which position it has been brought through the favor of the public toward the latter *modus operandi*. The electric horns themselves have gained in number so far as both the motor and the vibrator types are concerned. A noticeable tendency exists toward the small type of electric horn. The makers of the Klaxon began this movement by the announcement of the Klaxet and since then several well-known makers of vibrator and motor horns have brought out so-called junior types which are specially fitted for the needs of the small car. These horns consume a little less current then the other types and the noise they produce is generally not as strong as that made by the larger types and therefore better adapted for small cars.

The new horns seen at the show are the double-diaphragm Jaco, the Tuto-Ette, the Sparton motor horn, the Newtone Superior and Fire-Alarm types, the Electra, which is made by the same company as the Newtone; the Klaxet, the models JS, JM and D, Long Horn, the electrically operated Jericho, the Jericho Ford Special, the Nonpareil hand-operated ratchet horn, the Cubit vibrator horn type and the Riley-Klotz novelties.

Klaxon, Klaxonet, Klaxet—The line of signals made by the Lovell-McConnell Manufacturing Company, Newark, N. J., is being continued practically the same as what it was in the middle of last year. The Klaxon, Fig. 1, Klaxonet, Fig. 2, and Klaxet, Fig. 3, as well as the Combination Klaxon, have not been altered. The fact that the Klaxet is a new

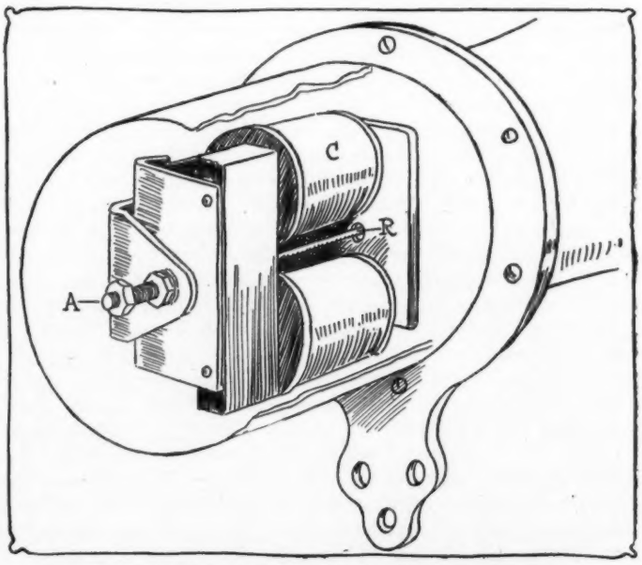


Fig. 4—Electra vibrator made by Newtone company

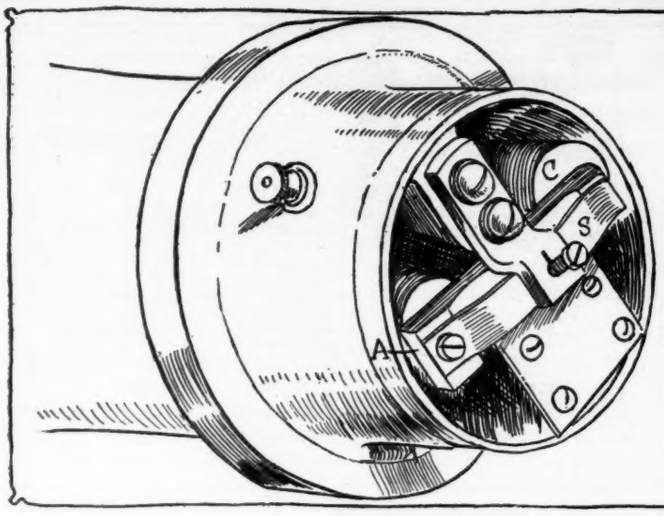


Fig. 5—Vibrator mechanism of Monoplex

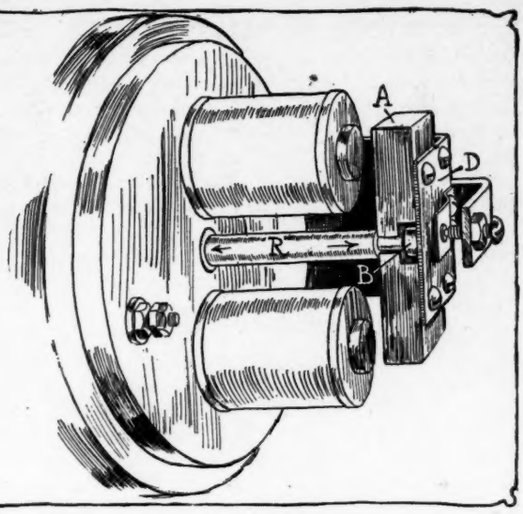


Fig. 6—Jaco double-diaphragm horn

device and one of the first attempts to produce a low-priced and high-class electric signal makes it advisable to give a short description of it here. It resembles in all essential features the larger horns made by the company, and differs from them principally by its lesser size and the arrangement of the motor M which is located horizontally in the casing, while in the Klaxon it is in a vertical position and in the Klaxonet inclined under approximately 40 degrees. A few details of constructions which are included in the larger type have been obviated in the case of the Klaxet, but the points of adjustment and lubricating details have been transferred to it from the larger designs. The current consumption is, of course, less than that of either of the large types. The sound is produced by the wheel W striking the button B on the diaphragm.

Newtone—Continuing its line of horns and adding to it three new devices, the Automobile Supply Manufacturing Company, Brooklyn, N. Y., is represented by five models. Models M, N and Torpedo are all dash designs and are continued practically without a change. The Newtone Superior is a novel product, built along similar lines to the larger models, but somewhat smaller than they. Finally, there is the Newtone Factory Fire Alarm type which is also well adapted for use on small cars. This type differs radically from all others in appearance, being equipped with a short and strongly flaring reflector and a casing finished in brilliant vermilion. The sound produced by the Superior and the Fire Alarm types—which latter, by the way, owes its name to the fact that the Fire Department of Jersey City has recommended it for installation in factories—is of the same pitch as that of the other types, but the Superior is distinguished by the large and the Alarm type by the smaller volume of the sound. One feature of the entire Newtone line for 1913 is the use of laminated armatures, which last year were used only on the Torpedo and M models. The field is likewise of laminated construction, being built up of seventy-five thin steel disks; and this new feature has made it possible to operate the same sizes of horn motors with much less current than before. An average consumption of 2.5 amperes is claimed.

Electra—The maker of the Newtone line of horns has added to this a new type of signal, named the Electra, Fig. 4, which is of the vibrator type. The construction is not radical in any way and simply embodies the principle of the buzzer which is also used in many other signals. The horn is about 3 inches in diameter, with a projector 6 inches in length and 4.5 inches wide. The finish is either brass or black and all horns are adapted for mounting on the dash. A core C moves the armature, adjustable at A, which has a rod R striking the diaphragm.

Jaco—The J. Alexander Manufacturing Company, New York City, continues the Jaco electric horn. Last year this signal employed a single diaphragm which was vibrated by the enlarged end of a rod attached to the armature of the

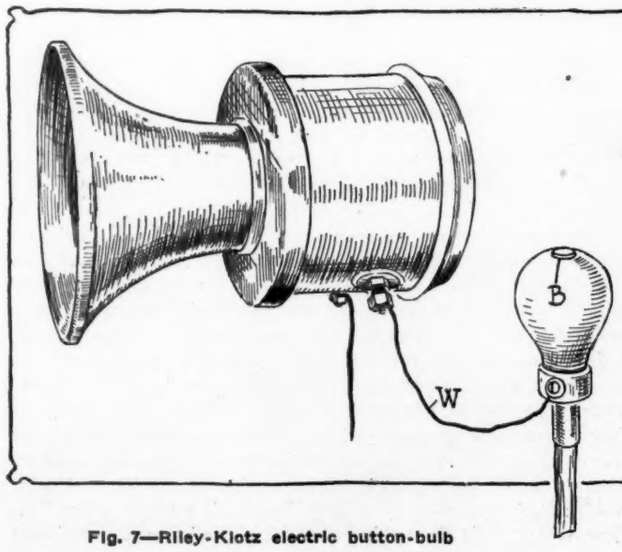


Fig. 7—Riley-Klotz electric button-bulb

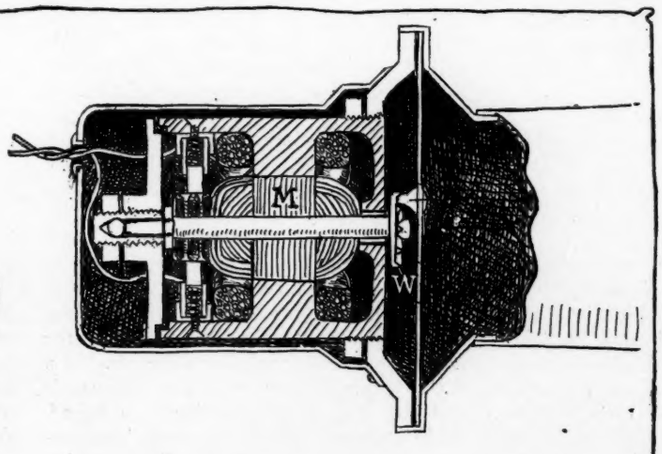


Fig. 8—Sparton electric motor horn

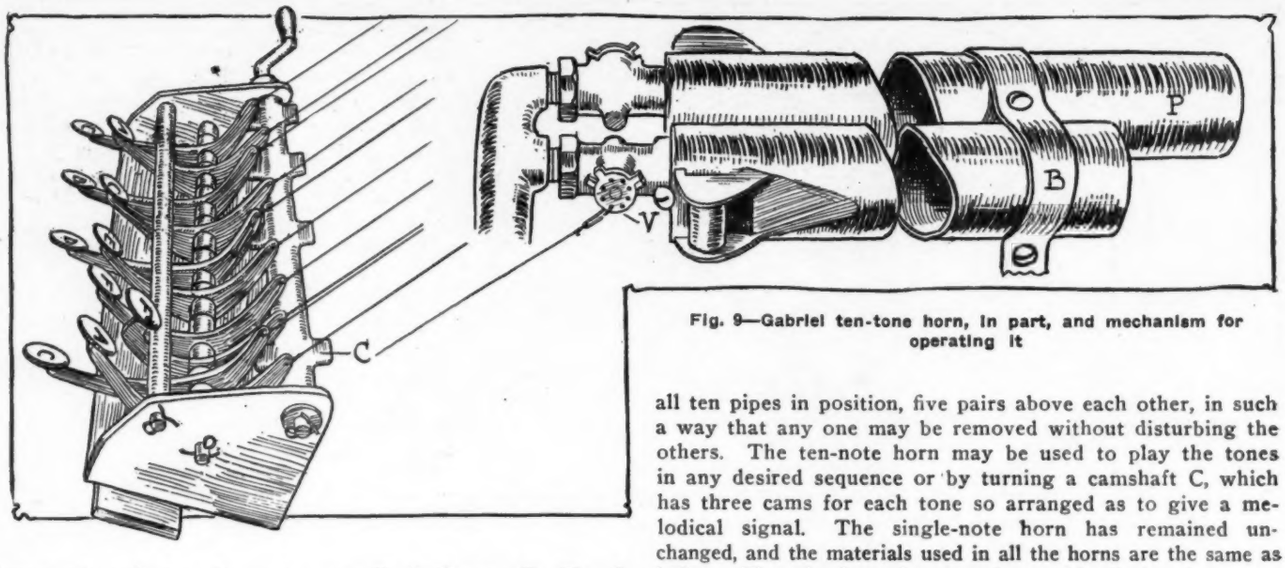


Fig. 9—Gabriel ten-tone horn, in part, and mechanism for operating it

magnetic coil, but for 1913 a small diaphragm D, Fig. 6, which is fastened to the side of the coil opposite to that attracting the armature A, has been added. A button B on the armature rod R strikes this small diaphragm when being attracted and the large one when being repulsed, so that a double series of sounds is produced, both of which follow each other alternately and rapidly, melting into a practically continuous tone. This is the only new development. The horn may be obtained in any of the finishes used nowadays for automobile signals.

Sparton—The Sparks-Withington Company, Jackson, Mich., known as a manufacturer of fans, has brought out a motor-driven horn, Fig. 8, coming in two types, the dash type and that going under the hood. The former is 12 inches long and has a resonator of the parabolically divergent type, while the latter has a shorter and narrower resonator. The construction differs in no essential from conventional practice. The armature shaft of the motor M carries a ratchet wheel W which, when the armature is rotated, strikes a button mounted eccentrically on the diaphragm, which is thereby caused to vibrate. The armature and field are laminated. This horn is finished in brass.

Monoplex—The Atwater Kent Manufacturing Works, Philadelphia, Pa., makes its Monoplex vibrator horn, Fig. 5, in two sizes which have not been changed since last year, except that the little type has a somewhat smaller diaphragm than before. Both types may be obtained in either nickel and black or brass and black finish. The average amperage necessary for working the horns is 2.5 amperes. The Atwater Kent company, due to increased manufacturing facilities has found it possible to reduce the price on this line of product.

Gabriel—The Gabriel Horn Manufacturing Company, Cleveland, O., continues its three types of musical horn, one of which has one note, the other four notes and the third ten, both in two sizes. The principle of this horn and the characteristic and pleasing signal it produces are well known; the horn is of the muffler-operated class and consists of as many pipes as it can produce tones. A manifold which is secured to the muffler outlet divided the exhaust into a number of leads, each conducting gas opposite the mouth of a pipe, where it streams freely into the air. If a valve V controlling this passage is closed, the exhaust is forced through a reed into the pipe P, producing a sound. The 1913 type of Gabriel horn includes several improvements. All the valves on the ten-tone horn, Fig. 9, which are of the perforated, rotary disk order, operate now in the same direction, while formerly some were operated clockwise, and others vice versa. A combination bracket B holds all ten pipes in position, five pairs above each other, in such a way that any one may be removed without disturbing the others. The ten-note horn may be used to play the tones in any desired sequence or by turning a camshaft C, which has three cams for each tone so arranged as to give a melodical signal. The single-note horn has remained unchanged, and the materials used in all the horns are the same as before. There is also a four-tone horn with all pipes in one.

Sireno—An electric horn operating on the siren principle and which has not been changed since last year is the Sireno, made by the Sireno Company, New York. This device consists of an incased motor, the shaft of which carries an impeller fan. When the latter is rotated as the motor turns it forces a current of air forward, after having drawn it in through an opening in the rear wall of the casing. The air current is passed through a siren device which interrupts it and produces undulations of the air, resulting in sound. This interrupting device consists of a drum, the two plain surfaces of which have perforations in alignment with one another, and which contains a rotating wheel which is also perforated. The wheel which is turned by the air current interrupts the latter and is thus the generator of sound. A projector serves to intensify the sound. This type of signal is made in three sizes: Sireno, consumption 6.5 amperes; Junior, consumption 5 amperes; Midget, consumption 4 amperes.

Tuto—The line of vibrator horns made by the Dean Electric Company, Elyria, O., continues from last year with none but minor improvements. It will be remembered that the principle of this horn is along vibrator-signal lines, the circuit of the sound-producing current being made and broken by the armature of the magnetic coil in the horn. It is stated by the makers that this year's Tuto produces a much louder signal than the previous model and the sound carries about one-third farther than before. The smaller types of this horn, known as Rexo and Tuto-Ette, respectively, are built on similar lines as the larger model. Instead of producing either of two sounds—such as may be obtained from the Tuto by pressing a button to one of two stops whereby various resistances are inserted in the circuit—the Rexo is capable of goving only one sound, but the Tuto-Ette is fitted with a two-tone button. The vibrator principle is the same as in the Tuto. Adjustment of the sound is by a screw which varies the limit of movement of the armature spring returning the armature to its original position, when the current is interrupted. Both types of horn are furnished with either a long or a short projector and in any desired finish, the standard being brass and any other finish being furnished on a very small additional price.

Jericho—The Randall-Faichney Company, Boston, Mass., continues the former types of Jericho and Jubilee horns which operate on the exhaust of the motor if the latter is forced through the reed of the horn by closing a by-pass valve. The Jericho horn may this year be obtained with an electric-operating mechanism, consisting of an incased solenoid coil S, operated by a push button B and on a dry battery, which pulls the cable controlling the by-pass mentioned

above, thereby causing the exhaust to pass through the horn. Another addition to the Jericho line is a miniature model specially designed for Ford cars which may be slipped over the exhaust pipe of the Ford muffler without the use of a coupling. This Ford horn is 8 inches long, finished in aluminum, and is guaranteed for the life of the car.

Aermore—The Aermore Manufacturing Company, Chicago, Ill., continues its exhaust horn without a change. This horn, designed to give a strong but pleasing signal, consists of a manifold pipe which is attached to the end of the exhaust pipe or to a side pipe entering the exhaust pipe; from this manifold, four small outlet pipes lead to the signal pipes, four of which signal pipes are provided, all being different in length. If the signal is operated a valve directs the exhaust into the manifold and thence through the signal pipes, producing a four-tone accord.

Cubit—A new electrical horn, operating on the vibrator principle, was shown by the Kosmak Electrical Company, Jersey City, N. J. This horn has the vibrating armature attached by a single screw to the center of the diaphragm which is held in place along its periphery, being fastened to the casing by means of screws. A make-and-break current vibrates the armature and with it the center of the diaphragm, creating a series of undulations resulting in sound. The horn requires for its operation from 1.5 to 2.5 amperes of a 6-volt current.

Waymaker—The Lee Tire & Rubber Company, Conshohocken, Pa., continues its Waymaker horn, Fig. 11, without any radical changes but simplified in one or two minor respect. The bulb control of the horn, with the bulb secured to the steering wheel, is now practically standard and it is hardly probable that the company will once more replace this convenient method of operating the horn by the pedal formerly used.

Nightingale—The Riley-Klotz Manufacturing Company, Newark, N. J., shows a full line of bulb horns in many styles as well as its Nightingale whistle which is being continued from last year. The new features of this company's line are: A chime horn, 15 inches in length and operated by a bulb, which may be attached to the steering wheel of the car and the Alpha whistle which is exhaust-operated and fitted to the exhaust pipe. It consists of a resonator drum into which exhaust gas enters through a reed passage, if its free exit from the muffler into the atmosphere is prevented by the closing of a valve. The latter is operated by a chain from the dash, which chain may be connected to either a pedal or a hand lever. Another novelty is the button-bulb which serves for operating both a bulb and an electric horn. This bulb is fitted over the end of the flexible casing through which the air is forced into the horn, and in its apex contains a button B controlling a contact; the latter closes an electric circuit when the horn is pressed as shown in Fig. 7, while the ordinary operation of the bulb produces a sound in the bulb horn.

Long Horn—One of the cleverest productions of the horn field during the year 1912 was the Long Horn, made by the G. Piel Company, Long Island City, N. Y. This horn creates the signalling sound much in the same way as motor-driven horns, namely, by the striking of a ratchet wheel on the steel button mounted on an acoustic diaphragm. The wheel is actuated by a rack when the handle of the horn is pushed down; the handle being returned to its original position by the pressure of a spring. Model S which was brought out last year is being continued, and models JS, JM and D have been constructed during the latter months of 1912. Model JS is a smaller reproduction of model S, and JM differs from JS by the shorter type of resonator. In model D the handle which operates the ratchet and diaphragm has been supplanted by a Bowden wire which slides in a flexible casing and pulls down the rack instead of pushing it down as the handle does. The way of operating it is by means of a cam, to which the Bowden wire is fixed, which is depressed and pulls the wire from under the rack, whereby the pinion is operated.

Nonpareil—The Nonpareil Horn Manufacturing Company of New York City, besides its usual line of bulb horns is now bringing out a hand-operated ratchet and diaphragm signal in which the ratchet is connected to a handle fitted diametrically across the back cover of the horn; the turning of this handle operates the ratchet, and the pitch of the teeth engaging the button on the diaphragm is such that a piercing signal is thereby produced.

Non-Skid Devices

Weed Tire Chain

The Weed tire chain made by the Weed Tire Chain Grip Company, New York City, is the most widely used accessory to be found in this country. The principle is simple, consisting of a series of cross chains lying on the surface of the tire attached to two circumferential side chains. There have been no material changes in the construction during the past year. In order to maintain uniform tension of the chains over the tread of the tire chains adjusters are used. These consist of several springs connected with lengths of chain, the ends of the latter being fitted with hooks to fasten on the outside body of the chain proper which prevents skidding.

Woodworth Tire Grips and Treads

The Woodworth tread manufactured by the Leather Tire Goods Company, Niagara Falls, N. Y., consists of a leather covering for the tire in which a number of metal rivets are imbedded. A new type has been added called the double grip, in which the studs previously employed have been supplemented by more studs standing higher than the major portion. The tread is applied over the outer casing and held in position by a series of hooks.

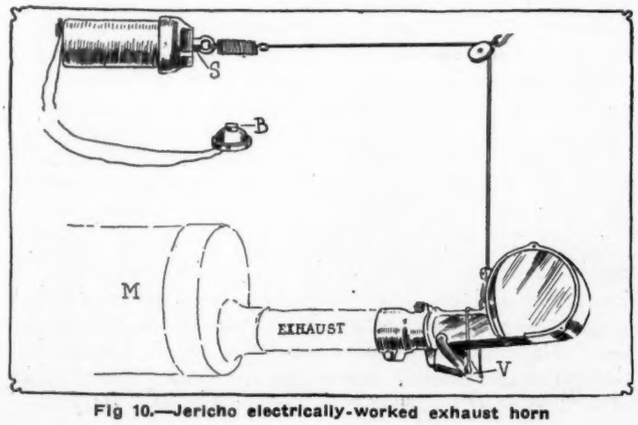


Fig 10.—Jericho electrically-worked exhaust horn

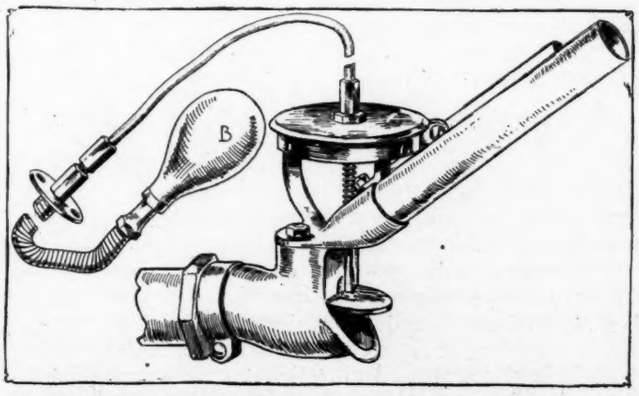


Fig 11—Waymaker exhaust signal operated from steering wheel

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Truck Maker's Burden

READ the letter on the opposite page from the Commissioner of Docks in New York City before reading this editorial.

This letter should be read and re-read by every manufacturer of motor trucks and delivery wagons, if he markets them in New York City or in any of the other big cities of America.

It should be read and meditated upon by every builder of motor commercial vehicles in the country, whether building fire-department machines or tractors for agricultural uses. There is a note of common interest in it to all.

This letter tells the reason why so many industrial houses in New York City and in other cities hold back from buying motor vehicles to replace their present horse-drawn equipment.

This letter suggests to the manufacturers of motor freight vehicles the necessity for co-operating with municipal authorities, and insisting on modernizing steamboat and railroad terminals not only in New York City but also in Chicago and a score of other cities, where the present antiquated means of handling freight are inflicting an enormously heavy toll on the introduction of the motor truck.

When the Commissioner of Docks in New York City reports as follows, then it is high time that manufacturers of trucks and our national automobile organizations get together with dock and terminal commissioners and give them all information on what physical requirements the modern motor truck calls for at these terminals.

First—Great cities of modern times are made possible only by improved transportation methods which permit raw materials, food and fuel to be regularly supplied to concentrated masses of population.

Second—Improved transit methods and cold storage have revolutionized city living conditions and if railroad and steamship terminals shall be properly co-ordinated so that unnecessary handling, storage and truckage shall be avoided city living conditions will be materially benefited.

Third—The administration of the Port of New York is a great national responsibility rather than a local city affair.

Fourth—New York in recent years has grown at the rate of over 4 per cent. per annum, yet during the past three years virtually nothing has been done to provide for the growing demands of commerce.

Fifth—New York's orderly development is hampered by lack of modern terminals and connections between them more than by anything else.

Sixth—All of the railroad and steamboat terminals of the port should be ultimately converted into public terminals publicly controlled.

Seventh—Local retail markets, like local postoffices, distributed about the city at convenient points, may later on be found necessary as adjuncts to wholesale terminal markets.

Eighth—Wherever it is practicable for suburban farmers to bring their produce by drays into the city, street markets should be provided for their convenience.

Ninth—The Dock Department of New York City is planning for the construction of public terminal markets near the water front in Manhattan, the Bronx, at Staten Island and at South Brooklyn.

Tenth—The railroad and steamship companies, being common carriers, have no interest in the commodities handled except to deliver safely the goods at the station called for by the bill of lading.

It would be wrong to expect that architects laying out plans for modern terminals and devising modern means for handling freight can design what is best for motor truck efficiency if the truck-making organizations fail to place before them the requirements. It is useless to wait until plans for these new terminals are completed and building commenced only to find entirely inadequate facilities provided. The situation calls for immediate united action on the part of the truck industry.

The motor truck is annually playing a greater part in city transportation and social conditons will demand that it play a still greater part. Hence the necessity of well-organized, rational, concerted action at the present time.

The tenth excerpt from the Commissioner's report shows that little may be looked for from the railroads excepting insofar as it concerns them and that their concern ends with delivery of freight at the terminal, the point at which the concern of the truck maker begins, hence if he looks to the railroad to protect his interests in this new terminal plan he will meet with disappointment.

The third excerpt, namely, that the administration of the Port of New York is a national rather than a local responsibility, points to the great influence that proper New York terminals will have on all of the other cities of the country; and if every facility to lay out these terminals to save loss of motor truck time in

The Motor Truck Maker's Burden

EDITOR THE AUTOMOBILE: *I understand economy of motor trucks is most noticeable on long hauls. I presume it would be equally true to state that short hauls would be more remunerative, providing the delays incident to loading and unloading could be materially cut down. With celerity of despatch at both ends, a series of short hauls under such conditions might approximate in economy the long haul where loading and unloading took more time.* The terminal delays at the railroad and steamship piers on the west side of Manhattan are the heaviest charge to which the commerce of the Port of New York is subjected. *These delays are serious enough in connection with the old-fashioned inexpensive horse dray, but in my judgment* they will materially diminish the opportunities for using motor trucks in city deliveries, unless remedied. *Frequently the horse trucks make only one trip a day to the west side steamship and railroad terminals.*

Modernization of these terminals I believe to be necessary if there is to be a general use of motor trucks in Manhattan. *In this connection I commend to your consideration the plans of the Dock Department for modernizing the terminals. The marginal railway, over which traffic should be as public and unobstructed as is the water in front of the docks, I believe to be a controlling factor.*—CALVIN TOMKINS, *Commissioner of Docks, New York City.*

loading and unloading is accomplished, these means will be widely imitated throughout the entire country. It is an opportunity not to be overlooked, and offers an economical solution so far as motor truck interests are concerned.

Excerpt eight points to the erection of local retail markets throughout the city for suburban farmers, or truck gardeners. These terminals must be adapted to motor truck needs, because within 5 years this work will practically all be done by motors. The track makers should lay before the necessary parties what they consider rational arrangements in such markets.

That motor trucks are losing much time in loading and unloading at the New York freight terminals was proven in a paper read before the National Association of Automobile Manufacturers at its Detroit Convention last November on this subject. Observations made at the terminals of the west side of Manhattan showed that on one day the delays of trucks and horse vehicles averaged 11 minutes per vehicle and on the following day 15.5 minutes per vehicle. Some individual cases showed delays of over 2 hours waiting to load or unload. These facts are corroborated by Commissioner Tomkins' letter, namely, "frequently horse trucks make only one trip a day to the west side steamship and railroad terminals."

These terminal delays are due to a variety of causes, some because of the drivers, some because of the clerical forces within the terminals, some because of the physical arrangements of the terminals, and others because of the inadequate space and objectionable loading and unloading methods used. No matter what the cause of the delay, the net result operates against the motor truck maker. He bears the burden. If only one trip per day can be made to some of these terminals by horse vehicles what hope is there to sell motor trucks to such owners of horse vehicles?

Truck makers must unite; they must put their shoulders to the wheel; they must get out of the narrow sphere of manufacturing and testing; they have to go out into the field of operation and insist that antiquated horse-pace environments be eliminated and modern facilities installed. When dock commissioners realize the forlorn situation, no better opportunity could possibly present itself. Immediate action is needed.

Business at the Truck Show

WHILE there were some who were dissatisfied on the whole, the New York truck show which closed Saturday night was conceded by the manufacturers who exhibited, to be a great success. It must be remembered that people who walk into a showroom and buy a truck without any previous arrangements are very scarce indeed, yet there were many instances where that very thing occurred both at the Palace and at the Garden. Some of the exhibitors sold as many as six trucks at retail to purchasers who had not been prospects before the show opened.

One of the most promising features of the show was the large number of new agencies secured. Many of the exhibitors who did not sell a single truck during the entire show week more than made up for this lack of retail business by the agencies closed in large centers. From all reports it is evident that many of the up-state people were in town to look the trucks over and to select that which they would like to represent in their town.

The number of foreign agencies closed this year was remarkable. An example of this Lippard-Stewart, which, according to sales manager W. F. Reynolds, appointed as a direct result of the show, agents in Australia; Cape Town, South Africa; Venezuela; Philippine Islands; Buenos Ayres and Montevideo. This concern made ten actual retail closures at the show nearly all of which, however, were prospective buyers before the opening day. The Service Motor Car Company also closed a number of foreign agents according to Jean Marks. Those who signed up represented Colon, Australia and New Zealand.

In most cases it was difficult indeed for a sales manager to tell what the net result of the show would be. The number of prospectives secured was in some instances high while the actual sales were few.

Big contracts secured during the show week were not scarce and although these cannot be published owing to the fact that details are still pending it can be stated that the General Vehicle Company, according to F. N. Carle, closed a sale of twenty-five 5-ton electric trucks with Jacob Ruppert, and twenty 5-ton trucks with George Ehret. The Atterbury company closed an order for six trucks with the La France Auto Garage Company of Elmira, N. Y. Two of these were 2-ton trucks, the other four consisting of a 5-ton, 3-ton, 1-ton and a 1,500-pound wagon. This concern sold, according to F. Lindoerfer, sales manager, twenty-seven commercial vehicles as a result of last year's show.

The attendance at the Garden show was good, that at the Palace not so good. In fact the exhibitors of accessories during the truck week, closed up their stands and left before the show was over. They were located on the upper floors and nobody got up their except a few stragglers. During the pleasure car week conditions were different, all the exhibitors being kept constantly busy.

General interior of Belgium's combined automobile and aviation show

European Exhibition Circuit Is Closed

Belgium's National Show a Representative One—Few New Makes Shown

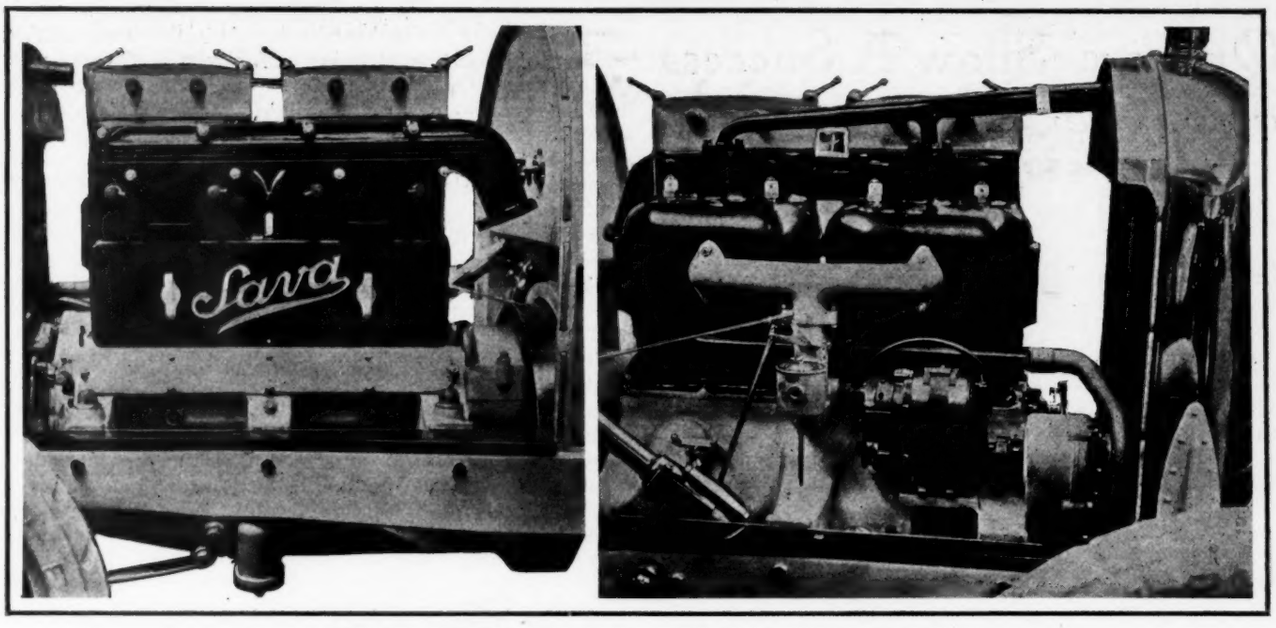
BRUSSELS, Jan. 13.—With the Brussels show the series of important European motor exhibitions comes to a close, for although there are a few more shows they are all of a provincial nature and will not reveal anything not previously seen at London, Paris, or in the Belgian capital. The present show, the twelfth of a series, is being held in the Palais du Cinquantenaire, and unites 196 exhibitors, compared with 175 last year and eighty-two in 1911.

Although Belgium is an automobile manufacturing country of considerable importance, the native manufacturers are outnumbered by the French, the number of French car makers having stands in the hall being twenty-one; Belgians, sixteen; German, seven; English, three; Spanish, one, and America has as its representatives Ford, Hupmobile, Overland and Flanders. The total value of the exhibits is estimated at $750,000, of which aeroplanes are responsible for $180,000.

Among the few entirely new models is a four-cylinder Sava car with its 4.3 by 6.2-inch cylinders in pairs. The valve disposition is of the superimposed type, commonly applied to all Sava cars, the intakes being operated by overhead rocker arms contained within an aluminum housing and working in oil. The pushrods being within the cylinder casting and the valve stems being inclosed, there are no visible moving parts. The gas passages are cast with the cylinders, but the exhaust manifold is bolted on, this being the disposition adopted on the large majority of Belgian cars, and indeed on most European cars. The integrally cast water-cooled exhaust manifold is less commonly employed on account of its tendency to overheat the cooling water if special provision is not made. This new Sava chassis has timing gears at both front and rear. At the rear the camshaft is driven by silent chain, the top of the housing being detachable in order to give admission to the chain and the camshaft pinion. The chain drive for the magneto and water pump is at the front. There is a detachable cover over the camshaft housing and a compression release on the camshaft for ease in starting up. Ribs are cast on the base chamber for cooling.

The shaft between the cone clutch and the four-speed gearbox is incased by an extension of the gearbox in a manner adopted this year for the first time by Renault. A feature of the gearbox is the method of forced-feed lubrication instead of by grease churned up by the gears. In the base of the gearbox is an oil reservoir from which a pump draws lubricant and directs it onto the face of the teeth in contact. The gearwheels do not dip in the oil. There is an aluminum housing round the transverse gearshifter rod, this housing also combining the sector, and being entirely independent of the frame member. The housing being merely bolted onto the gearbox, is made in various lengths to suit individual requirements, thus making it possible to bring the sector directly over the frame member or within it, as desired. Overhead worm drive is employed, the Sava company appearing to be the only one in Belgium preferring this to bevel gearing. The worm is carried in a concentric sleeve and can be adjusted externally with the greatest ease. The driving effort is taken through the springs, and the torque provided for by a tubular housing with forked arms, around the propeller shaft. Greasers are also provided for the trunnion mounting of the radiator. The rear brake mechanism is rather an interesting feature. On the forward end of the torque tube is a transverse bar carrying a grooved pulley mounted on a vertical axis. One end of the bar is pivoted, and the other end is connected by a ball-and-socket joint to the connecting rod going to the brake pedal. A cable passes round the pulley, one end being attached to each of the rear brake levers. The arrangement is neat and simple and gives a perfect equalizing effort.

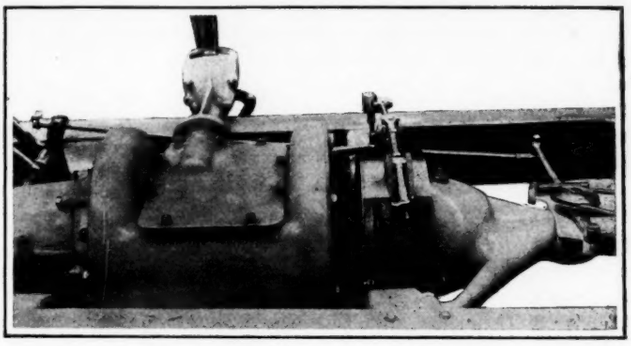
Non-poppet valve types of motors are not a strong feature in Belgium. The Minerva company is building the Knight exclusively, and Germain has one model with the Knight motor. There appear to be no other non-poppet valve motors built in Belgium. Germain has produced a new model for the coming



The Sava motor was one of the new features at Brussel's show

season, but it is of the poppet valve type, its dimensions being 3.1 by 5.5 inches bore and stroke, with the four cylinders cast in one block and offset in relation to the crankshaft. Two independent chains are used for driving the magneto and water pump and the crankshaft, and are placed at the flywheel end. Lubrication of the motor is under a pressure of 40 pounds to the square inch, the pump being driven off the camshaft and the oil leads to the three main bearings being external.

Among the outstanding features of the Belgian construction are three and five-bearing crankshafts for four-cylinder motors, forced-feed lubrication to either all or to the main bearings, with constant-level troughs for the connecting rod ends; a tendency to put the chain or timing gears at the rear of the motor; high-tension ignition with either variable or automatic advance; metal clutches more frequently than cone type; four-speed gearboxes, and shaft drive with a torque tube surrounding the propeller shaft. A considerable effort has been made to reduce the unsprung weight of the rear axle by the use of higher-grade material. Wire or detachable steel wheels are very commonly employed. Cranking motors are altogether unknown, but electric lighting dynamos are either fitted or provision is made for fitting them on the majority of chassis.



Unique Gearbox design on Sava chassis

Number Cylinders	BORE AND STROKE Millimetres	Inches	Cylinders	Cylinder Type	Camshaft Drive	Speeds
Metallurgique						
4	75x 96	2.95x3.78	Block	L	Chain	4
4	80x130	3.15x5.12	Block	L	Chain	4
4	90x140	3.54x5.51	Block	L	Chain	4
4	101x150	3.98x5.91	Pairs	L	Chain	4
4	125x150	4.96x5.91	Pairs	L	Chain	4
Excelsior						
4	85x130	3.35x5.12	Block	L	Chain	3
6	85x130	3.35x5.12	Block	L	Chain	3
6	90x140	3.54x5.51	Threes	L	Chain	3
F.A.B.						
4	75x120	2.95x4.72	Block	L	Gears	4
4	90x140	3.54x5.51	Block	L	Gears	4
F. N.						
4	69x130	2.72x5.12	Block	T	Gears	4
4	85x120	3.35x4.72	Block	T	Gears	4
4	125x140	4.92x5.51	Pairs	T	Gears	4
F. I. F.						
4	75x120	2.95x4.72	Block	L	Chain	4
4	75x130	2.95x5.12	Block	L	Chain	4
4	75x130	2.95x5.91	Block	L	Chain	4
4	65x110	2.56x4.33	Block	L	Chain	4
Germain						
4	80x140	3.15x5.51	Block	L	Chain	4
4	90x130	3.54x5.12	Pairs	K	Chain	4
4	92x150	3.62x5.91	Separate	L	Chain	4
4	102x140	4.02x5.51	Pairs	K	Chain	4
4	86x110	3.39x4.33	Separate	L	Chain	4
Linon						
4	75x120	2.95x4.72	Block	L	Chain	4
4	80x140	3.15x5.51	Block	L	Chain	4
4	90x150	3.54x5.91	Block	L	Chain	4

Number Cylinders	BORE AND STROKE Millimetres	Inches	Cylinders	Cylinder Type	Camshaft Drive	Speeds
Miesse						
4	80x110	3.15x4.33	Block	L	Gears	3
4	90x140	3.54x5.51	Block	L	Gears	4
4	80x140	3.15x5.51	Block	L	Gears	4
4	100x140	3.94x5.51	Block	L	Gears	4
Minerva						
*4	75x120	2.95x4.72	Block	K	Chain	4
4	90x130	3.54x5.12	Pairs	K	Chain	4
4	100x140	3.94x5.51	Pairs	K	Chain	4
4	124x150	4.88x5.91	Pairs	K	Chain	4
Nagant						
4	70x118	2.76x4.65	Pairs	L	Chain	4
4	90x120	3.54x4.72	Pairs	L	Chain	4
4	90x130	3.54x5.12	Pairs	L	Chain	4
4	90x150	3.54x5.91	Pairs	L	Chain	4
4	106x130	4.17x5.12	Pairs	L	Chain	4
4	106x150	4.17x5.91	Pairs	L	Chain	4
Pipe						
4	75x110	2.95x4.33	Block	I	Chain	4
4	75x120	2.95x4.72	Block	L	Chain	4
4	80x150	3.15x5.91	Block	L	Chain	4
4	100x180	3.94x7.09	Pairs	L	Chain	4
4	140x180	5.51x7.09	Pairs	I	Chain	4
Sava* S						
4	75x140	2.95x5.51	Block	S	Chains	4
4	82x140	3.23x5.51	Block	S	Chains	4
4	110x160	4.33x6.30	Pairs	S	Chains	4
Springuel						
4	75x100	2.95x3.94	Block	L	Gears	4
4	70x120	2.76x4.72	Block	L	Gears	4
4	80x130	3.15x5.12	Block	L	Gears	4
4	90x140	3.54x5.51	Pairs	L	Gears	4
4	100x160	3.94x6.30	Pairs	L	Gears	4

L—L-head. K—Knight. I—Overhead. S—Superimposed. *Worm-driven models.

Quakers' Show A Success

Week's Attendance 35,000—New Business Done 50 Per Cent. in Excess of That Done Last Year

Sixty-nine Makes of Cars on View and Score of Accessory Displays

PHILADELPHIA, PA., Jan. 25—Neither in point of attendance nor in the amount of business transacted has any former automobile show approached the record established by the twelfth annual motor car exhibition held in the mammoth new garage of the Automobile Club of Philadelphia, under the auspices of the local Automobile Trade Association, Part I of which closed tonight.

While no accurate figures upon which to base a comparison are available, the week's attendance has been conservatively estimated to have been 35,000, a daily average of 5,000, while as a business proposition the amount of new business actually consummated will show an average increase of 50 per cent. over last year, with an exceptionally strong list of prospects. For the most part the visitors at this year's show were a discriminating lot, and the expectations engendered by last Saturday night's record-breaking opening that this would be the most successful automobile show ever held in Philadelphia were fully realized. Individual exhibitors to a man are enthusiastic over the results attained.

Sixty-nine Makes of Cars Shown

Sixty-nine different makes of cars were represented on the three floors of the Automobile Club's building, occupying approximately 90,000 square feet of space. In addition there were over a score of accessories dealers. Probably 90 per cent. of all the displays had been installed when the show opened on Saturday night, but an almost entirely changed view presented itself on Monday, the transformation having been accomplished over Sunday, when many of the exhibits temporarily placed for opening night gave way to others brought over from New York upon completion of the pleasure car exhibit there. Many minor changes looking toward the relief of congestion similar to that which characterized Saturday night had also been made by the management. The service of the two 20-foot elevators used to haul passengers was rearranged, one being confined to carrying visitors up and the other down only. A hand rail dividing the wide stairway had also been built.

Wednesday evening was observed as Club Night, the 1,600 members of the Automobile Club of Philadelphia having been specially invited to attend the show as guests of the Philadelphia Automobile Trade Association. Representatives of the Rambler car from eastern Pennsylvania and New Jersey also attended the show on Wednesday, piloted around by F. E. Devlin, local manager of the Rambler agency.

Thursday was set aside as Society Day, when the price of admission was doubled, and although it rained most of the day and night a good attendance was noted, the automobile owner and prospective owner predominating. This was the day the electric came into its own, the fair sex lingering around the booths where the electrics were being demonstrated eagerly absorbing information.

Following a close second to the pleasure car exhibit both in the variety of displays and in general interest, Part II of the show will open on Monday morning with the most comprehensive collection of motor trucks ever assembled in this city. Thirty-one different makes will be shown, ranging from 500 pounds capacity to 10 tons. This less handsome but more utilitarian exhibition will comprise commercial vehicles adapted to every purpose of every business in which the transportation problem figures. Demonstrating the maximum of efficiency with the minimum of expense appeals to the business man, consequently the coming week's show will be a strictly business proposition, so a decided falling off in attendance is anticipated. No change in the interior decorative scheme will be made for the coming week's show and the nightly musical concerts will continue.

Notwithstanding the immense exhibition conducted in the Automobile Club of Philadelphia building, Twenty-third and Market streets, the first annual domestic and importers' exhibition conducted under the auspices of the Philadelphia Board of Trade, Ltd., in the First Regiment Armory, Broad and Callowhill streets, closed a successful week tonight. Indeed, so successful was this initial effort at a combination show that a permanent organization has been effected, with the object in view of making the Importers' Salon an annual fixture.

Costly and luxurious foreign models ranging in price from $8,000 to $18,000, none of which had ever before been exhibited in Philadelphia, were the magnet that attracted motor car enthusiasts. Side by side was shown a representative collection of American cars.

Tire Makers Adopt Standard Guarantee

At a meeting of the Motor and Accessory Manufacturers' Association held during the show period in New York City a standard form of tire guarantee has been adopted. Some false reports have been circulated that this will mean the forced abandonment of all mileage guarantees. This is not true, although it is likely that the ultimate result will be that several concerns now guaranteeing a definite mileage will abandon this policy. This is a matter, however, which is up to the individual manufacturer. The wording of the new guarantee is as follows:

We guarantee all Pneumatic Automobile Tires, bearing our name and serial number, to be free from imperfections in material and workmanship. Tires returned for consideration under this guarantee will be accepted only when all transportation charges are prepaid. If, upon examination, it is our judgment that tires are defective, they will be repaired or replaced at our option.

When tires are replaced by us, charges will be made to owners at the time new tires are delivered, for such amounts as in our judgment will compensate for the service rendered by such replaced tires.

Tires worn out in usual or unusual service, abused knowingly or unknowingly, misused, used on rims not bearing these stamps, injured through accident or design, are not covered by this guarantee.

(Manufacturer's name) Pneumatic Automobile Tires are not guaranteed to give any definite miles of service and any and all guarantees are expressly waived by any purchaser of these tires who uses therein any substitute for air; or who uses them under weights or in excess of those for which the various tires are recommended, or who does not keep tire inflated to the pressure recommended by us.

Two Interesting Opinions Rendered

ST. PAUL, MINN., Jan. 27—Two opinions affecting automobile companies have been handed down by the Supreme Court. In the first, that of the Travelers' Casualty Company against the Fawkes Automobile Company, the court held that in the case it devolved on the defendant to show he exercised ordinary care in keeping the property which he admitted inability to return to meet a *prima facie* breach of contract. "Where the proprietor of an automobile repair shop had notice that his foreman had proclivities rendering it likely that he would injure cars left at the shop for repairs, by taking them out at improper times and make unauthorized use of them, it was such proprietor's duty to exercise ordinary care to protect such cars from the danger of injury to which they were thus subjected. The action of the court, in an action for injury to an automobile in a collision which occurred while the foreman of the defendant's repair shop was using it for his own private purposes, in submitting to the jury the question whether the defendant was guilty of negligence in retaining such foreman in his employ is sustained. The contention that the complainant failed to state a cause of action held in any event too late when made for the first time on appeal. Where the facts litigated were known to the defendant, a variance, if any, between the complainants and his proofs is held harmless. Where the defendant in an action for injury to an automobile had acted virtually as appraiser between the plaintiff,

an insurance company and the owner of the machine, and the plaintiff had paid the owner the amount of the loss fixed by such appraisement, the defendant was estopped to introduce evidence as to the value of the machine. Other claims were held to be without merit."

In the second case, F. W. Geiss against the Twin City Taxicab Company, appellant, the court's opinion read: "First, where a servant, without authority from the master, permits a stranger to assist him in his work for the master, and such stranger, in the presence of the servant and with his consent, negligently does such work, the master is liable for such negligence."

Briscoe Heads French Company

PARIS, Jan. 18—On the latest list of French joint stock companies appears the announcement "Briscoe Freres, a company for experimental and research work in automobile construction, with headquarters at Billancourt, Seine." Inquiries revealed the fact that the new French company has Benjamin Briscoe at its head and that work is actively progressing on a car for the American market. Interviewed by THE AUTOMOBILE representative, Mr. Briscoe admitted that he was laying plans for a big business campaign. His intention in coming to France was not primarily to enter the European market, but to get on the American market on a larger scale and on a more solid foundation than ever before.

The car would be sold in America fully equipped for less than $1,000. It was learned that the preliminary work is well advanced and that the first models will be entirely completed and tested out in France. When all the preliminary work has been completed, its construction in large quantities is to be commenced in America. It is stated that the car will be ready in ample time for the 1914's season's trade.

Stephenson vs. Case Suit in Court

MILWAUKEE, WIS. Jan. 25.—Arguments are now being heard in the circuit court of Milwaukee county, Branch IV, in the case of the Stephenson Motor Truck Company against the J. I. Case Threshing Machine Company and Pierce Motor Company of Racine, Wis., since merged under one name. The Stephenson company sues for $100,000 for breach of contract, claiming that the Case concern contracted to purchase its entire output and later the entire plant and real estate. The trial of the case lasted nearly a month, and the volume of testimony on which arguments are now being made cover more than 5,000 typewritten pages. A decision is expected early in February.

Hughes and Mercer Company Sued

MILWAUKEE, WIS., Jan. 27.—Hughey Hughes and the Mercer Automobile Company of Trenton, N. J., have been made defendants in a suit for $10,000 damages for personal injuries by Charles Hoch, a farmer residing near the Wauwatosa course, on which the last Vanderbilt cup and grand prix races were held. Hoch alleges that Hughes struck his wagon, throwing him out and injuring him, probably permanently. He asks $10,000.

Indiana Branch of S. A. E. to Meet

INDIANAPOLIS, IND., Jan. 27—The Indiana branch of the Society of Automobile Engineers will discuss motor fuel at the monthly meeting of the branch to be held February 18. John A. Secor is to be one of the principal speakers.

INDIANAPOLIS, IND., Jan. 27—The Empire Automobile Company announces that owing to the fact that it was unable to secure adequate space at the National Automobile Show at Chicago, it will have a special exhibit at the salesroom of the Ralph Temple Automobile Company. The concern manufactures a five-passenger touring car.

Chicago Ready for Show

Exhibition to Open on Schedule Time—There Will Be 600 Exhibitors—Many Accessories To Show

Pleasure Car Exhibits Will Number 100 and Those of Commercial Vehicles Seventy-eight

CHICAGO, ILL., Jan. 27—As usual, Samuel A. Miles, general manager of the National Association of Automobile Manufacturers, will have his show ready on time. Since the middle of last week his decorators have been busy in the three buildings which comprise the show unit this year, and by next Thursday afternoon it will be possible for those exhibitors, who so desire, to install their cars or sundries, and the show will open on schedule time at 1 o'clock next Saturday afternoon. Through the securing of the Wilson building, which is to the immediate south of the Coliseum annex, Miles has secured a little more room than he ever had before. For the first time in the history of the Chicago show there will be no foreign cars displayed. The Fiat is in, but it is now so thoroughly Americanized it is not now regarded as of foreign extraction.

In all there will be in the neighborhood of 600 exhibitors at the show, with 100 of these exhibiting pleasure cars and seventy-eight motor trucks. This is a slight increase over last year, when there were ninety-six pleasure car makes and sixty-five trucks. In the accessory line there are from thirty to thirty-five more exhibitors than last year, the majority of whom are going to exhibit both weeks of the show.

40,000 Attendance at Toledo Show

TOLEDO, O., Jan. 25—There were more than 40,000 persons in attendance at the Automobile Show given in the Terminal building on Cherry street by the Toledo Auto Shows Company, a large percentage of whom were farmers and persons living in small cities within a radius of 50 miles of Toledo. There were more than fifty exhibitors, and about 250 cars, of all classes, on the floor. Toledo manufacturers were well represented, especially in electric cars and trucks. The buying is being done by the farmers, this year, and they are buying $1,200 and $1,500 cars for the most part.

HARTFORD, CONN., Jan. 28—(*Special Telegram*)—Twelve makes of gasoline pleasure cars, one electric and two makes of gasoline commercial cars, were displayed at the second annual automobile show which opened Monday evening for the week at Waterbury, Conn. The attendance was fairly good and all indications point to a successful exhibition. The affair is being conducted shown by Hartford dealers. The decorations were effective.

PROVIDENCE, R. I., Jan. 25—Two motor car shows opened here this evening, one under the auspices of the Rhode Island Automobile Dealers' Association in the Armory and the other at the Narragansett Hotel held by some of the dealers who were unable to get space at the big show. The two shows will run for a week.

MILWAUKEE, WIS., Jan. 24.—A team match trophy tour between the Milwaukee Automobile Club and the Milwaukee Athletic Club and a match run with the Chicago Automobile Club are being figured out as the principal touring events of the Milwaukee motoring organization, which this year for the first time intends to engage in competitive touring.

Factory Miscellany

Large axle boring machine designed by the engineers of the American Locomotive Company. It is used in the manufacture of the axles of Alco cars

THE above illustration shows an extraordinarily large axle boring machine. Although built by a prominent manufacturer of machine tools this machine was designed in the factory of the American Locomotive Company, Providence, R. I., for use in the manufacture of the Alco pleasure axles. As may be noted the machine is driven by an electric motor which actuates the boring shaft through a train of gears. There are in reality two machines mounted in opposed fashion, the two cutting tools working toward each other. The illustration shows an axle in place, it having both its ends bored at the same time. Since the boring shafts are accurately aligned the axle is sure to be bored true by this machine. Although automatic in its action the rate of feed of the drill is under instantaneous control of the man in charge of the machine.

KEETON'S Big Factory—The Keeton Motor Company, Detroit, Mich., recently purchased the immense automobile plant formerly occupied by the Oliver Motor Car Company, paying $50,000. The property consists of three buildings of modern factory construction 220 feet by 80 feet each, and one building 140 feet by 40 feet. With other smaller buildings, the factory will comprise 50,000 square feet. Building No. 1 will be given over to the chassis assembling, and building No. 2, which is 110 feet by 80 feet, will be the rough test department. In building No. 3, which is of equal size to building No. 1, will be the rough and finished stock, receiving and shipping. The fourth building will be the machinery room, 140 feet by 80 feet, and the fifth building will be the painting and trimming room, same being 220 feet by 80 feet in size. The offices are contained in a projecting wing at the corner of the factory group.

Goodwin Car Company Building—The Goodwin Car Company, Chicago, Ill., is erecting a one-story factory, 60 feet by 200 feet, costing $20,000.

Mohawk Using Stein Plant—The Mohawk Rubber Company, Akron, O., has taken over the plant of the Stein Double Cushion Tire & Rubber Company.

Morrow's Plant—The Morrow Manufacturing Company, Elmira, N. Y., has adopted plans for a new addition, 700 feet by 100 feet, to its present automobile plant.

Falls Tire Increases Capacity—After March 1 the Falls Tire & Rubber Company, Cuyahoga Falls, O., will increase its tire capacity by installing new machinery.

Pennsylvania Rubber's Addition—The Pennsylvania Rubber Company, Jeannette, Pa., have plans in progress for a three-story factory addition, costing $100,000.

National to Build—The National Motor Vehicle Company, Indianapolis, Ind., is planning to build a three-story building, 83 feet by 97 feet brick addition to its factory.

Hanna Equipping Plant—The Hanna Motor Manufacturing Company, Kansas City, Mo., recently incorporated with a capital of $60,000, will equip a plant for the manufacture of motors.

Drop Forge Company's Addition—The Park Drop Forge Company, Cleveland, O., manufacturer of automobile forgings, has awarded contracts for the erection of an addition, to cost $9,000.

Speedway Recently Organized Builds—The Speedway Tire Company, recently organized in Louisville, Ky., with a capital of $250,000, will erect a large plant for the manufacture of automobile tires.

Amplex Builds Assembling Room—The Amplex Motor Car Company, Mishawaka, Ind., will erect an addition to be used as an assembling room. It will be one story high and 120 feet by 255 feet.

General Vehicle's Planning—The General Vehicle Company, New York City, has plans for a large factory which will be erected in the automobile manufacturing district of Long Island City, N. Y.

Michelin Adding—The Michelin Tire Company, Milltown, N. J., is adding a large wing to building No. 14. It will be one story high, with a second story over one portion of it. It will be constructed of reinforced concrete, with roof of saw-tooth design.

Automobile Foundry Destroyed—An explosion in the brass and aluminum foundry of the Buick Motor Car Company's plant at Flint, Mich., recently, destroyed that building and the machinery it contained. The total loss was estimated at $40,000. No one was seriously hurt.

The Automobile Calendar

Shows, Conventions, Etc.

Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.
Jan. 25-Feb. 1.....Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.
Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.
Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.
Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.
Jan. 27-Feb. 1.....Rochester, N. Y. Annual Show, Exposition Park, Dealers' Association.
Jan. 27-Feb. 1..... Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.
Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Jan. 27-Feb. 1..... Waterbury, Conn., Annual Show.
Feb. 1-8.....Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8.....Washington, D. C., Annual Show.
Feb. 8-15.....Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15.....Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.....Chicago, Ill., Truck Show.
Feb. 10-15.....Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.....Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.
Feb. 15-22.....Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.....Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.....Richmond, Va., Annual Show.
Feb. 17-22.....Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.....Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.....Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.....Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.....Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.....Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-23.....New Orleans, La., Annual Show.
Feb. 19-27.....Topeka, Kan., Annual Show.
Feb. 20-22.....Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.....Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.....Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.....Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.....Pittsburgh, Pa., Annual Automobile Show.
March 3-8.....Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.....Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.....Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.....Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8.....London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15.....Boston, Mass., Annual Automobile Show.
Mar. 8-15.....Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.....Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.....Boston, Mass., Annual Truck Show.
March 20-24.....New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.....Indianapolis, Ind., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

March .....France, Sealed Bonnet 3000-Mile Run.
March 31.....Montevidio, Uruguay, International Competition of Agricultural Motor Vehicles.
April.....Barcelona, Spain, International Exhibition.
May..... St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Dayton's Branch Factory—It is stated that the Dayton Motor Truck Company, Dayton, O., will establish a branch factory at Chattanooga, Tenn.

Fire at Studebaker Factory—Fire broke out in the basement of the plant of the Studebaker Corporation, South Bend, Ind., but no damage was done.

Ravenna Erecting Plant—The Ravenna Auto Truck Company, Ravenna, O., is erecting a plant 50 feet by 150 feet for the manufacture of the Ravenna automobile truck.

Beaver's Vancouver Plant—The Beaver Automobile Company, Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant at Vancouver, Wash., for the manufacture of automobiles.

Morgan & Wright Adds—The Morgan & Wright Company, Detroit, Mich., tire manufacturer, is beginning work on a five-story addition to its plant, 94 feet by 250 feet, to cost about $100,000.

Automobile Works Sold—The Findlay Motor Works, Findlay, O., have been sold to J. G. Cleary, of Milwaukee, Wis., who will dismantle the plant and remove the machinery to that city. The price paid was $50,000.

Garage Equipment's Building—The Garage Equipment Manufacturing Company, Milwaukee, Wis., is receiving bids for rebuilding its factory recently destroyed by fire. The building will be one-story high and 100 feet by 93 feet.

Abolishes Factory Manager Office—The management of the Abbott Motor Company, Detroit, Mich., has abolished the office of factory manager, the duties formerly attached to this position being divided between the general manager and the factory superintendent.

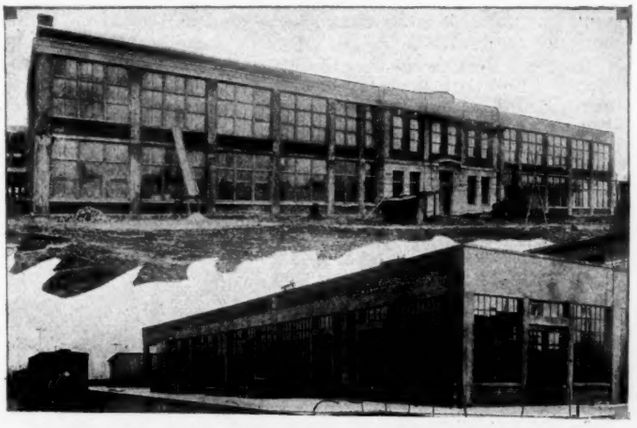
Factory Additions at Passaic—The Manhattan Rubber Manufacturing Company, Passaic, N. J., is contemplating large additions to its factory. There is at present being completed the erection of a hose department building, as well as a box factory and machine shop.

Nova Scotia's Plant Completed—The main building of the Nova Scotia Carriage & Motor Car Company, Amherst, N. S., and the power house and dry kilns have been completed. It is 60 feet by 340 feet and four stories high. The automobile department is being transferred from Kentville, N. S.

Beckman Looking for Site—J. E. Beckman, of Chicago, Ill., president of a company producing transmissions and gears for automobiles and trucks, is in Kenosha, Wis., to look over the ground with a view to establishing a factory. The company is capitalized at $100,000, and is employing from 50 to 75 men in its temporary factory at Chicago.

Cumberland Equipping Factory—The Cumberland Motor Company, Pineville, Ky., recently incorporated for $50,000, will equip a factory to manufacture a patented spring motor. The machinery required includes automatic gear-cutting machines, lathes, scrapers, screw machines, drills and spring coilers.

Timken's Offices Installed—The offices of the Timken-Detroit Axle Company, Detroit, Mich., will soon be installed in the new office building recently erected by the company at the plant. The new office building is about 60 feet by 200 feet and four stories high. It will give the company a frontage of 750 feet on Clark street. The parent company, the Timken Roller Bearing Company, has completed a new grinding room at the Canton, O., plant.



The Prest-O-Lite Company's new plant at Indianapolis, Ind., costing over $500,000 with four times the capacity of the present factory. There are ten buildings in the group occupying 15 acres of ground

News of the Week Condensed

Testimonial banquet tendered to Past-President W. H. Blood, Jr., at Delmonico's January 16 by the Electric Vehicle Association of America

WOULD Change Show Dates—Harry Fosdick, director of sales for the Hupp Motor Car Company, Detroit, Mich., recently asserted himself in regard to the time of automobile shows, stating that the dates are too late now for the manufacturer who has his entire output sold at the time the shows come along and that September would be a much more preferable month.

Five Fords for Columbus—The post office at Columbus, O., has installed five Fords in its parcel post service.

Hobron McGraw Manager—The McGraw Tire & Rubber Company's New York City branch is now under the management of R. F. Hobron.

Hoyme Philadelphia Alco Manager—C. R. Hoyme has been appointed manager of Alco trucks and cars in Philadelphia, Pa., and in charge of both sales and service.

Clark & Hubbell Handle Alco—V. L. Clark and G. C. Hubbell have formed a company in Des Moines, Ia., known as the Commercial Motors Company, and will handle Alco trucks.

KisselKar for Stockton—The Kissel Motor Car Company, Hartford, Wis., has just delivered a 50-horsepower police patrol to the city of Stockton, Cal. In test this car developed 46 miles an hour.

Rayfield Service Branch in New York—The Findeisen & Kropf Company, manufacturers of the Rayfield carbureter, has established its own sales and service branch in New York City at 1902 Broadway.

Overland's Quarterly Dividend—It is officially stated that the dividend of 1.5 per cent. recently declared on Willys-Overland common stock is a quarterly dividend, thereby placing the stock on a 6 per cent. basis.

Sanders Abbott Sales Manager—The Abbott Motor Company, Detroit, Mich., has appointed L. B. Sanders sales manager. Mr. Sanders formerly occupied a like position with the Lion Motor Car Company, Adrian, Mich.

Davis King Manager—Archie B. Davis, formerly assistant manager and sales manager for the United Motors Detroit Company, has become manager of the Michigan branch of the King Motor Car Company, with headquarters at Detroit, Mich.

Credit to Wire Wheels—The detachable wire wheels on which speeds from 84 to 92 miles per hour were made on Brooklands track in England, as mentioned on page 270 of the January 23 issue of THE AUTOMOBILE, were of the Rudge-Whitworth type.

Columbus Aims for Safety—The Columbus Automobile Club, through President N. J. Ruggles and its legislative committee, will seek for several laws before the Ohio General Assembly which will tend to make the operation of an automobile on the streets and highways of the country more safe.

Bosch Appoints Three Distributors—The Bosch Magneto Company, New York City, has appointed the Doubleday-Hill Electric Company, Pittsburgh, Pa.; the Phœnix Automobile Supply Company, St. Louis, Mo., and The Motor Parts Company, Boston, Mass., as distributors of its product in their territories.

Philadelphia Forbids Loud Siren—In an order issued by Superintendent of Police Robinson of Philadelphia, Pa., automobilists are prohibited from using high power siren horns. The order states that as the new automobile fire apparatus is equipped with the high power sirens private automobilists are prohibited from using the warning signal.

Michelin Granted Drawback—The treasury department at Washington, D. C., has issued a ruling allowing drawback, under section 25 of the tariff act of 1909, on tire containers manufactured by the Michelin Tire Company, Milltown, N. J., with the use of imported special wrapping paper in conjunction with domestic corrugated paper. The allowance shall not exceed the quantity of imported special wrapping paper used.

Liquor Revenue for Roads—The idea of applying one-half of the total moneys collected by towns, villages and cities of Wisconsin for retail liquor, or saloon licenses, to the state aid for highway improvement fund, has come before the Wisconsin Legislature in the form of a bill by Senator Howard Teasdale, of Sparta. He believes about $1,000,000 can be raised for permanent road work in Wisconsin every year by this means.

Crude Oil Supply Diminished—Wisconsin municipalities which have been using oil for laying dust and preserving macadam streets and roadways, are wondering if the recent action of the Standard Oil Company in greatly diminishing the supply of crude oil and sending the price from $2.50 and $3.50 to $5.50 and $6 will affect that grade of oil used for street work. The material is the final residue of petroleum after distillation. New contracts are being delayed by common councils until the situation clarifies.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Baltimore, Md.	Moon	Cooper & Sinclair
Belleville, Ill.	Moon	Geo. W. Sahlender
Bishops Hill, Ill.	Moon	P. L. Johnson
Carmi, Ill.	Moon	T. H. Land
Davenport, Iowa	Lozier	Meinert Bros.
Evansville, Wis.	Ford	Townsend & Hyne
Edwardsville, Ill.	Moon	C. A. Keller Co.
Franklin, Ill.	Moon	C. F. Whitlock
Harrisburg, Ill.	Moon	Chas. V. Parker
Kankakee, Ill.	Moon	W. H. Ohde
Long Branch, N. J.	Pullman	C. D. McFadden
Louisville, Ky.	Regal	Standard Automobile Co.
Louisville, Ky.	Paige	Louisville Lozier Co.
Louisville, Ky.	Pierce-Arrow	Hite D. Bowman
Louisville, Ky.	Detroiter	Inter State Motor Sales Co.
Manitowoc, Wis.	Ford	Pauly & Olson
Naples, Italy.	Pullman	Achille Scognamillo
Niobrara, Neb.	Moon	E. L. Gillham
North Attleboro, Mass.	Moon	Elmer Rhodes
Oyster Bay, N. Y.	Pullman	Sagamore Garage Co.
Providence, R. I.	Pullman	R. J. Davis
Plankington, S. Dak.	Moon	J. S. Barton
Pander, Neb.	Moon	H. D. Rixon
Sunbury, Pa.	Pullman	I. J. Reitz
Syracuse, N. Y.	Paige	Syracuse Motor Car Co.
Sioux City, Ia.	Pullman	Southwick & Maxfield
Washington, D. C.	Pathfinder	John S. Berryman
Washington, D. C.	Winton	Burr Bros.
Washington, D. C.	Case	R. C. Creyke
Washington, D. C.	Knox	Burr Bros.
Washington, D. C.	Moon	Frederic Newburgh

COMMERCIAL VEHICLES

Bowling Green, O.	Modern Truck	Twin City Motor Car Co.
Louisville, Ky.	Mack	Commercial Motors Co.
Louisville, Ky.	Saurer	Commercial Motors Co.

ELECTRIC VEHICLES

Milwaukee, Wis.	Baker Electric	Kopmeier Motor Car Co.

Chattanooga's Two Automobiles—In order to handle the increased business of the Chattanooga, Tenn., post office two automobiles have been added to the delivery equipment of the office.

Each County to Draw $2,000—Every one of the sixty-seven counties in Alabama has been authorized to draw $2,000 as its share of the first installment of the state road assistance fund.

Knight Tire in Baltimore—The Knight Tire & Rubber Company, Baltimore, Md., has opened offices and salesrooms at 1417 North Charles street. W. T. Kuhns and C. B. Chambers are in charge.

Spitzley Resigns—Carl J. Spitzley, who has been connected with the sales branch of the Abbott Motor Company at Detroit, Mich., for a long time, has resigned his position to enter the real estate business in that city.

Venezuela's Good Roads—Due to the government appropriation of 1,000,000 bolivars for the improvement of highways near the capital city of Venezuela, a much greater demand for automobiles is expected.

Acquits Mayor Shank—A jury in a justice of the peace court at Oakland, Ind., has acquitted Mayor Shank of Indianapolis, Ind., on the charge of fast driving while he was catching and arresting another speeder.

Moyer Brings Out Car—H. A. Moyer, a pleasure car manufacturer in Syracuse, N. Y., has brought out a new two-passenger roadster equipped with a 4 1-2 by 5-inch motor, combination electrical self-starter, ignition and a lighting device.

Glover's New Quarters—Permanent quarters on the third floor of a new building in Indianapolis, Ind., have been taken by the Glover Equipment Company of that city, manufacturers of the Antidam radiator protector, tops, dust hoods and seat covers.

Wabash Club Formed—An automobile club has been formed at Wabash, Ind., with C. H. La Salle as president and William Dixon as secretary. There is a large number of charter members. Particular attention is to be paid to obtaining better roads.

New Electric Service Station—There is to be included in the Syracuse, N. Y., agency for Baker electric pleasure and commercial cars a large garage and public service station equipped with the latest type of General Electric Company's charging apparatus in charge of experts.

Kelly Baltimore Branch Discontinued—The Baltimore, Md., branch of the Kelly-Springfield Motor Truck Company has been discontinued and hereafter the Kelly truck will be handled in Maryland and the District of Columbia territories by the C. B. B. Motor Company, Baltimore.

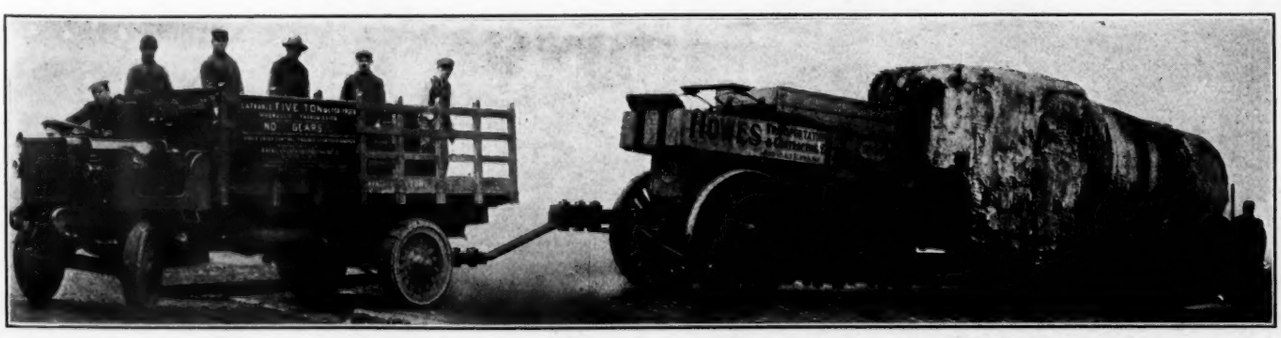
Sheen Purchasing Agent—Frank J. Sheen has been appointed purchasing agent of the Abbott Motor Company, Detroit, Mich. Until his new appointment Mr. Sheen was in charge of the stores and tracing department of that company, with which he has been connected for several years.

Seagrave's Fire Apparatus—The city of Madison, Wis., state capital, has just placed in service its first motor fire-fighting apparatus, a six-cylinder Seagrave flying squadron car manufactured according to the Madison departmental specifications by the Seagrave Company, of Columbus, O.

Henderson in Indianapolis Race—The Henderson Motor Car Company, Indianapolis, Ind., has confirmed a report that it expects to enter a car in the 500-mile race to be held at the Indianapolis Motor Speedway, Memorial Day. Bill Knipper is to be nominated as driver. Details concerning the car to be entered are not forthcoming at this time, but it is reported that the entry will be a four-cylinder machine.

New Indiana Light Bill—Another bill of interest to automobile owners has been introduced in the Indiana Legislature. This provides that the tail lamp shall be arranged to illuminate the registration numbers after night. The bill is the result of several instances where pedestrians have been run down after night and the drivers have not stopped, and it has been impossible to identify either the car or driver.

Indianapolis' New Show Space—It is regarded as likely that the Indianapolis, Ind., Automobile Trade Association will decide to hold its annual automobile show, which is to be held in March, in the downtown district. Last year the show was held in a huge tent near the business district, but this year a plan to hold it at the coliseum at the state fair grounds north of the city has been discussed. It has now been suggested that the show be held in the first three stories of the Murphy power building in Georgia street, which is a fireproof structure and within one square of the center of the business district.



La France truck with hydraulic transmission hauling boiler weighing 23 tons. Truck weighs 12.5 tons

Building a road in the desert near Phoenix, Ariz., showing what the builders faced when they started work on the Arrow Weed Road

The first stage in the building of the Arrow Weed Road, showing Mexicans shoveling sand from the road bed

Nashville to Hold Show—Nashville, Tenn., automobile dealers have decided to hold a show in March. The date is to be selected later.

Washington Firm Moves—The Commercial Auto & Supply Company, Studebaker agents, will remove in the near future to 817 Fourteenth street.

Fire Wagon for Malden—The Boston, Mass., branch of the White Automobile Company has just delivered to the fire department of Malden, Mass., a combination hose and chemical wagon, and it has gone into commission right away. It is mounted on the 40-horsepower chassis and has a number of features new to fire vehicles.

To Motorize Fire Department—Complete motorization of the Hartford, Conn., fire department is desired by the board of fire commissioners. About $200,000 is needed to accomplish the end. Four-wheel drive tractors, combination chemicals to replace the present horse wagons, and various other pieces of apparatus are considered in the budget.

Automobile Incorporations

AUTOMOBILES AND PARTS

DETROIT, MICH.—Standard Tool & Manufacturing Company; capital, $20,000; to manufacture tools. Incorporators: J. G. Heal, R. C. Dorman, T. P. Penniman.

HAMILTON, O.—George Automatic Roller Bearing Company; capital, $550,000; to manufacture and deal in roller bearings and parts of vehicles and automobiles. Incorporators: Walter H. Miller, Geo. T. Reise, Chas. E. Heiser, Edward Ritchie, C. R. Greer.

INDIANAPOLIS, IND.—John Brothers' Motor Company; capital, $70,000; to manufacture motor car, marine and aeroplane motors and monoplanes. Incorporators: Louis J. Johnson, Harry Johnson, Julius Johnson, J. W. Sackrider, Demas Deming, Chas. Minshall, Ora D. Davis.

MASSILLON, O.—Massillon Rubber Company; capital, $25,000. Incorporators: Robert R. Hess, Albert Geis, F. McLain, W. Arnold, Harry V. Hess.

NEW YORK CITY.—Safety Auto Control Corporation; capital, $500; to manufacture devices for automobiles. Incorporators: Howard K. Wood, H. O. Coughlan, Joseph F. Curtin.

NEW YORK CITY.—Eureka Machine Company, Incorporated; capital, $5,000; to manufacture automobile accessories. Incorporators: Joseph Prosky, Philip Frankel, Frank A. Dillingham.

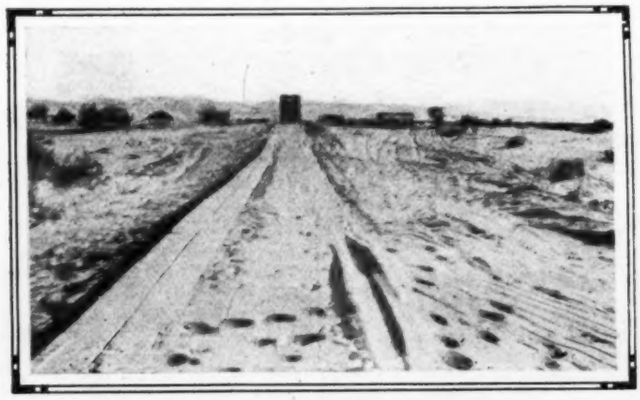
NEW YORK CITY.—The Club Garage, Inc.; capital, $5,000. Incorporators: Jerome L. Davis, Thos. A. Kilfoil, Samuel I. Goldberg.

ST. LOUIS, MO.—T. J. Moss Motor Car Company; capital, $10,000; to establish a garage and repair shop. Incorporators: T. J. Moss, J. W. Fristoe, E. J. Dykstra.

WACO, TEX.—Waco Auto Supply Company; capital, $5,000; to deal in accessories. Incorporators: W. H. Montz, H. B. Lyne, James Harrison.

YOAKUM, TEX.—Yoakum Machine Shop & Garage; capital, $10,000; to do a general garage business. Incorporators: W. L. Orth, L. A. Orth, M. S. Orth.

YONKERS, N. Y.—Ralph B. Hibbard, Incorporated; capital, $5,000; to do a general garage business. Incorporators: Ralph B. Hibbard, Louise P. Hibbard, Elliott W. Pitkin.



Showing the completed Arrow Weed Road

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Williamsburg Plaza Garage, Inc.; capital, $1,000. Incorporators: Louis Cantoni, Frank Furnell, Adolph Furnell.

BUFFALO, N. Y.—F. A. M. Auto Supply Company; capital, $20,000. Incorporators: Frank A. Marburg, R. A. Felthousen, John B. Green, Geo. D. Shaw, R. T. Templeton.

CHICAGO, ILL.—Burgess-Hovey Company; capital, $25,000; to manufacture automobile accessories. Incorporators: F. O. Koepke, F. W. Bigelow.

CINCINNATI, O.—Model Garage Company; capital, $10,000; to operate a garage and repair shop and to run a taxicab business. Incorporators: Edward Hine, Martin Fette, Carl Riechelman, Clara Hine, Della Cottrell.

CLEVELAND, O.—Coronet Mfg. Company; capital, $60,000; to manufacture a speedometer for automobiles. Incorporators: Harry W. Garberson and others.

CLEVELAND, O.—Universal Accessories Company; capital, $5,000; to deal in automobile accessories and machinery of all kinds. Incorporators: Carl Spero, T. W. Rutlege, R. E. Vernes, H. C. Roth, F. C. Baisch, Jr., J. J. Ripner, H. C. Clarke.

CLEVELAND, O.—Krankless Starter & Mfg. Company; capital, $25,000. Incorporators: A. G. Freeman, F. A. Sweet, Fred H. Gerber, J. B. Label, R. E. Andrews.

DETROIT, MICH.—Detroit Flash Curtain Company; capital, $25,000; to manufacture automobile curtains, windshields and other accessories. Incorporators: F. J. Schaffer, W. H. Goodfellow, H. M. Vaughn.

HUDSON FALLS, N. Y.—Kingsbury Motor Sales Company; capital, $10,000; to deal in autos. Incorporators: Earle H. Wells, Esther L. Wells, Leonard Wetsell.

INDIANAPOLIS, IND.—Ray Harroun Company; capital, $30,000; to manufacture and sell automobiles and automobile parts. Incorporators: Ray W. Harroun, L. R. Townsley, U. G. Baker.

LOUISVILLE, KY.—Standard Auto Company; capital, $25,000. Incorporators: George A. Dunham, Clifford L. Alderson, J. H. Alderson.

MUSKOGEE, OKLA.—Pioneer Motor Company; capital, $5,000; to manufacture automobiles. Incorporators: G. S. Waddell, H. G. Butts, M. L. Waddell.

NEW YORK CITY.—Bell & Waring Steam Vehicle Company; capital, $25,000; to deal in automobiles. Incorporators: Harry G. Waring, Harvey W. Bell, Howard G. Phillips.

NEW YORK CITY.—Brown Car Corporation; capital, $30,000; to deal in automobiles. Incorporators: W. P. Fargo, H. W. Torney, E. E. Beyer.

NEW YORK CITY.—Duplex Gasoline Motor Company; capital, $200,000; to manufacture motors, etc. Incorporators: G. W. Woodruff, A. B. Nevin, T. U. Parker.

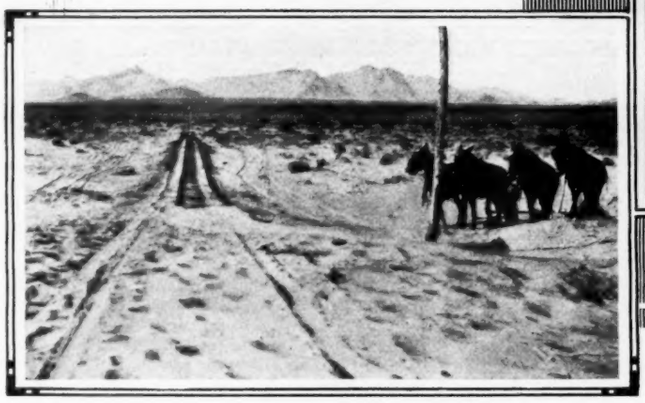
NEW YORK CITY.—Favary Tire Company; capital, $300,000; to deal in automobile tires. Incorporators: E. Favaary, M. W. Brashears, C. S. Boyd.

NEW YORK CITY.—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: R. W. Strauch, T. P. Gilman, E. S. Peck.

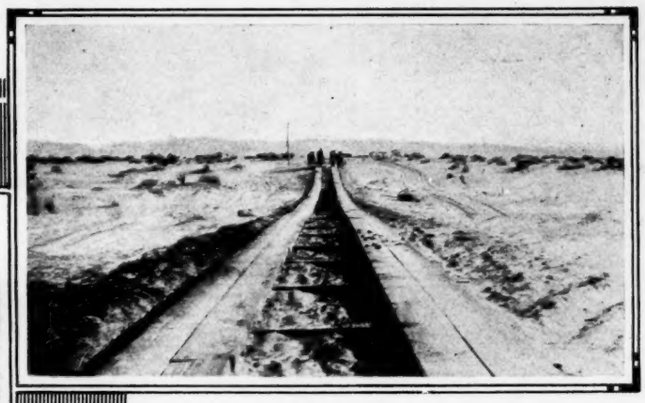
NEW YORK CITY.—Owners Purchasing Association, Inc.; capital, $5,000; to do a general automobile business. Incorporators: Leonard J. Field and Irving P. Regensburger, Charles Olsen.

AKRON, O.—Mohawk Rubber Company; capital, $30,000; to manufacture and deal in automobile tires and rubber goods of all kinds. Incorporators: R. M. Pillmore, J. K. Williams, S. S. Miller, F. J. Mishler, Francis Sieberling.

ALEDO, ILL.—Aledo Machine Company; capital, $50,000; to do a general automobile business. Incorporators: C. A. Miller, G. D. Venable, R. D Watson.



Second stage in the building of the Arrow Weed Road. Filling in the sand between the boards and ties



How the lumber road appeared just after boards were laid on the ties and before the road bed had been filled in

BROOKLYN, N. Y.—Newkirk Avenue Automobile Company, Inc.; capital, $5,000. Incorporators: Wm. Backus, Jennie Hunton, W. D. Maxwell.

BUFFALO, N. Y.—Glide Sales Company; capital, $10,000; to deal in autos. Incorporators: J. Francis Lynch, Louis P. Fuhrmann, Edward T. Danaby.

CAMDEN, N. J.—United States Tire Filler Company; capital, $125,000; to deal in automobile tires, automobiles, etc. Incorporators: R. B. Patton, H. E. Patton, H. R. Gorman.

CLEVELAND, O.—Automobile Clearing House Company; capital, $2,500; to deal in new and second hand motor cars. Incorporators: Thos. A. Reilly, Ed. P. Bernardi, Samuel P. Bromley, Arthur N. Hirsch, John B. Bromley, Jr.

CLEVELAND, O.—Ohio Auto Carriage Company; capital, $10,000; to manufacture automobile bodies. Incorporators: Alfred A. Benesch, Ralph Goldsworthy, F. A. Federman, Reuben Shapiro, E. H. Chaloupka.

CLEVELAND, O.—Ohio Cutting Sales Company; capital, $10,000; to deal in motor vehicles and accessories. Incorporators: W. K. Stanley, John C. Koepke, J. N. Wolfinger, E. D. Tanner, A. V. Kindel.

COLUMBUS, O.—Park Motors Company; capital, $30,000; to manufacture and deal in electrically propelled vehicles of all kinds. Incorporators: Scott Van Etten, Chas. Parkison, Amelia Van Etten, Wm. C. Horton, Chas. F. Hodge.

CONNERSVILLE, IND.—Central Car Company; capital, $100,000; to manufacture automobiles. Incorporators: J. E. Huston, J. W. Burk, E. W. Ensted, R. T. Huston, F. I. Barrows, J. M. Heron.

CONNERSVILLE, IND.—Howard Motor Car Co.; capital, $10,000. Incorporators: Guilford C. Babcock, Harry Tuttle, Clarence Millard.

DETROIT, MICH.—Kessler Detroit Motor Car Company; capital, $10,000; to manufacture automobiles. Incorporators: H. C. Brooks, Jr., Robert McCormick.

DETROIT, MICH.—Detroit Motor & Machine Company; capital, $150,000; to manufacture motors, etc. Incorporators: H. J. Hayes, H. H. Smith.

DUQUESNE, PA.—Duquesne Automobile & Wagon Company; capital, $5,000; to deal in automobiles and trucks. Incorporators: J. J. McCloskey, Jr., Walter Gray, J. F. Walton, R. P. Morrow.

NEW YORK CITY.—Maxim Tricar Manufacturing Corporation; capital, $100,000; to manufacture and deal in automobiles. Incorporators: Otto Kuhneman, Chas. F. Novotny, A. A. Meschutt.

NEW YORK CITY.—F. W. Ofeldt & Sons; capital, $20,000; to manufacture motor trucks. Incorporators: E. G. Ofeldt, F. A. Ofeldt, E. Y. Eltonhead.

NEW YORK CITY.—Mills Motor Radiator Corporation; capital, $650,000; to manufacture and deal in radiators. Incorporators: H. R. Bingham, A. F. Carbe, C. A. Cole.

NEW YORK CITY.—Shepherd Auto Company; capital, $5,000; incorporators: Irving R. Shepherd, Fannie E. Shepherd, Joseph A. Shepherd.

NEW YORK CITY.—Webster-McGowan, Incorporated; capital, $50,000; to manufacture motors, engines, etc. Incorporators: G. H. McGowan, Wm. H. Webster, H. F. Monroe.

NEW YORK CITY.—Western Vehicle Company, Inc.; capital, $1,000; to manufacture motor vehicles. Incorporators: Harry Davis, Wm. R. Williams, Chas. M. Frost.

PITTSBURGH, PA.—Kline Car Motor Company; capital, $5,000; to deal in automobiles. Incorporators: J. D. Kerr, S. E. Kerr, R. N. Gibson.

RICHMOND BORO.—K. & K. Motor Car Company; capital, $10,000; to deal in automobiles. Incorporators: Lillian E. Killian, Agnes E. Killian, Frank B. Killian.

ROCHESTER, N. Y.—Ball-Washburne Motor Company, Incorporated; capital, $25,000. Incorporators: Ward H. Ball, Chas. H. Washburne, Asa R. Ball.

SALT LAKE CITY, UTAH.—Alkire-Smith Auto Company; capital, $25,000. Incorporators: Fred W. Alkire, Raymond B. Smith, Myron L. Smith.

SOUTH ORANGE, N. J.—K-W Garage, Incorporated; capital, $25,000; to do a general automobile business. Incorporators: G. E. Krug, T. R. Were, C. L. Krug.

ST. LOUIS, MO.—Coller-Reitz Motor Car Company; capital, $5,000; to do a general motor car business. Incorporators: Anthony Coller, Frank G. Reitz, Edwin Oldendorph.

ST. LOUIS, MO.—Pioneer Steel Block Tire Company; capital, $25,000; to manufacture a patented tire for use on automobile trucks. Incorporators: Wm. Dee Becker, J. Geo. Ganahl, Nicholas Le Brun, Fred A. Gerber.

TARRYTOWN, N. Y.—J. D. Maxwell Motor Corporation; capital, $10,000. Incorporators: Jonathan D. Maxwell, James P. McManus, Leander F. Sniffen.

TOLEDO, O.—Maumee Motor Car Company; capital, $10,000; to deal in automobiles. Incorporators: Richard D. Logan, A. J. Gallagher, R. E. Frankberger.

INCREASE OF CAPITAL

AKRON, O.—American Tire & Rubber Company; capital increase from $200,000 to $500,000.

Taylor with Erie Supply—W. O. Taylor has joined the Erie Supply Company, Toledo, O., as secretary and treasurer. He will manage the tire department.

U. S. Tire's Agency—The U. S. Tire Company has opened a branch agency at 218 North Erie street, Toledo, O., for an E. & W. tire treatment agency. The E. & W. treatment, it is claimed, seals punctures automatically and reduces tire expense 75 per cent.

Washington Club's Election—The Washington Motorists' Association, Washington, D. C., which succeeds the Automobile Club of Washington, has elected the following officers: President, Harrington Mills; vice-president, W. W. Chiswell, and secretary-treasurer, John K. Heyl.

Goodyear's Banquet—O. A. Richards, of the U. S. Tire Company, was the guest of honor and principal speaker at the annual banquet given by the Goodyear Rubber Company, Milwaukee, Wis., to department heads, salesmen and traveling representatives at the Hotel Pfister recently.

Automobile Incorporations

DETROIT, MICH.—Ely Auto Parts Company; capital increased from $25,000 to $45,000.

DETROIT, MICH.—Federal Motor Truck Co.; capital increased from $100,000 to $200,000.

LOUISVILLE, KY.—Brenner Motor Car Company; capital increased from $25,000 to $35,000.

LOUISVILLE, KY.—Rommel Motor Car Company; capital increased from $15,000 to $25,000.

MOLINE, ILL.—Velie Motor Vehicle Company; increase of capital from $400,000 to $600,000.

NASHVILLE, TENN.—E. O. Elliot & Company; capital increased to $50,000.

ROSSLYN, VA.—District Automobile Service Corporation; capital, $35,000 to $50,000. Incorporators: Geo. R. Cowie, Edmund S. Wolfe, L. Bert Nye.

SYRACUSE, N. Y.—H. H. Franklin Manufacturing Company; capital increased from $300,000 to $1,500,000.

One of the road builders' trucks in the heart of the desert

SPRING-TIRE Construction—Helical springs arranged in two planes dished relatively to the wheel plane.

Fig. 1 shows the subject matter of this patent, a wheel in which helical spoke springs S take the place of the solid spokes and make possible the use of a solid tire. The wheel consists of a rim and a hub to which the helical-spring spokes are attached with their ends. These springs are arranged in two series extending radially from the center of the wheel under a slight angle, to both sides of the wheelplane. The springs lie in radial indentations R of face plates P, which inclose the spokes and are attached to the rim and hub, by means of opposed peripheral flanges. The indentations on one plate are approximately flat at their inner ends, while those on the other face plate at their inner ends have a depth which is substantially equal to the coil diameter of the springs.

No. 1,051,178—to Thomas Whitehead, Blackpool, Eng. Granted January 21, 1913; filed December 12, 1911.

Automobile Cushion Tire—Constructed with two air spaces, one of which is made up of sections and the other continuous.

The tire described in this patent consists of a resilient casing formed with two annular air spaces in it, one of which is nearer to the rim than the other and is separated from the other by independently yieldable walls. The tire is constructed of transverse abutting sections S which are independently removable and have their places formed with interlocking projections and recesses; one of the projections surrounds the outer annular space and the other projections are located at either side thereof.

No. 1,050,861—to Andrew Minetree Smith, Petersburg, Va. Granted January 21, 1913; filed July 27, 1912.

Automobile Suspension Spring—Consisting of a semi-circular leaf spring supplementary to a full elliptical spring.

This patent refers to a spring construction shown in Fig. 3, S being a full elliptical leaf spring to which an auxiliary spring T, shaped in a semi-circle, is attached. Spring T is attached at its center to the center of the lower half of the main spring S and at its ends to points halfway between the center of the upper spring and its respective ends, there being a sliding connection between the spring ends of T and the leaves of the spring S. Due to its shape and the peculiar method of mounting the spring T does not interfere with a normal working of S, but checks extreme deflection and rebound on part of the latter.

No. 1,050,863—to Walter O. Smith, Petaluma, Cal. Granted January 21, 1913; filed October 16, 1912.

Pneumatic Automobile Tire—Which is automatically inflated by the rolling motion of the car, air being forced into an inner tube through a check valve.

The self-filling tire, Fig. 4, includes a main inner tube T around which a collapsible tube S is arranged; these two tubes are separated by a stiffening device M, which prevents air pressure in the tube T from collapsing the outer tube S. The tube T is equipped with a valve device V, which normally holds the collapsible tube open to the atmosphere and suitable means is used for preventing a back flow of air from tube T to the tube S. The means M is sufficiently yielding to permit of being forced outward by the expansion of the tube T and to operate V so as to close the tube S to the atmosphere when the pressure inside the tube T becomes sufficiently high.

No. 1,050,886—to Anson B. Wetherell, Pittsburgh, Pa. Granted January 21, 1913; filed February 23, 1910.

Electric Horn—Consisting of a motor-driven ratchet which strikes a button mounted eccentrically on a diaphragm.

This horn is of the motor-driven type, the shell of the motor being shaped as a cup with an open end over which fits a removable cover. The latter has a bearing for the motor shaft and the fields are wound about projections of the motor case. An amplifying projection extends beyond the closed end of the cup and to this amplifier the diaphragm and the projector are attached. A toothed disk for ratchet, which is attached to the front end of the motor shaft, strikes a button mounted eccentrically on this diaphragm when the motor revolves, thereby producing a signalling sound.

No. 1,048,466—to William Sparks, Jackson, Mich. Granted December 24, 1912; filed May 9, 1912.

Regulator for Leaf Springs—Consisting of mechanism for adjusting the flexibility of laminated springs by separating the blades.

Wedges are introduced for this purpose between the leaves and means for clamping the whole after adjustment is provided. A short shaft with oppositely screwed ends is arranged immediately under the axle, and by turning this the clamping shackles at each side of the axle are brought down firmly on the springs. The wedges are carried on disks and the action just referred to simultaneously operates them.

No. 1,050,138—to Maurice Houdaille, Paris, France. Granted January 21, 1913; filed July 24, 1911.

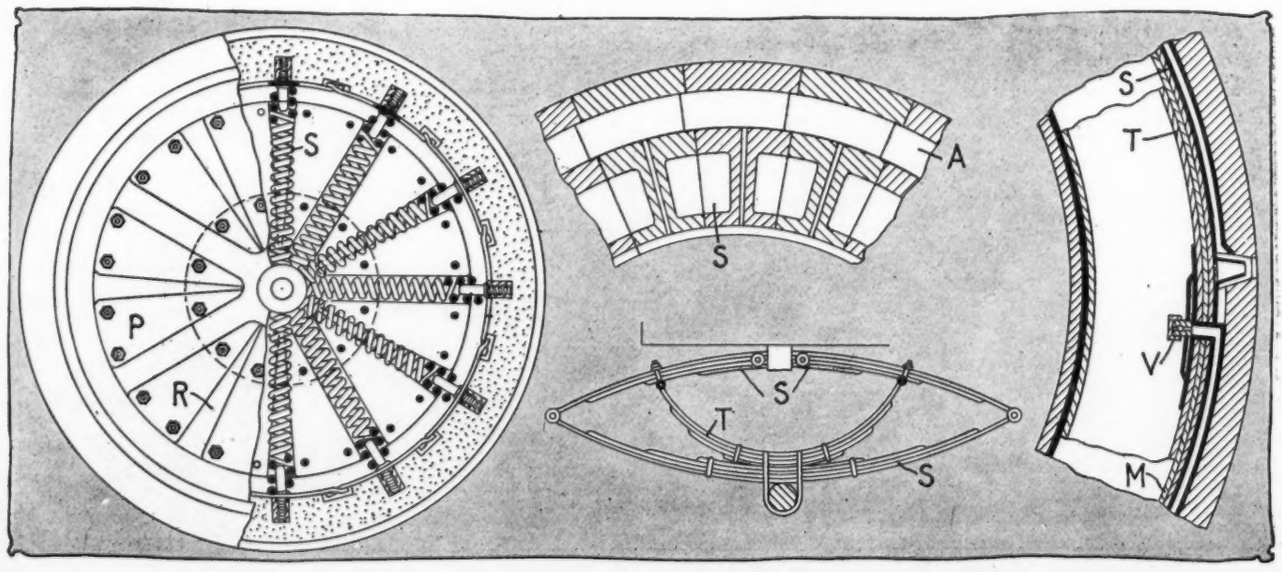


Fig. 1—Whitehead wheel. Fig. 2—Smith tire. Fig. 3—Smith spring. Fig. 4—Whetherell tire